AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

MAY 15, 1955

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Special Cars at Turin Automobile Show
Preview of Materials Handling Exposition
Rotary Heat Exchanger for Gas Turbines
Latest Engineering in Indianapolis Racers
Plating Plant Designed for Flexibility
Many Uses of Aluminum in Automatic Drives

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A CHILTON PUBLICATION

stack loading + auto-chucking = 130 PARTS/HR

on this Heald Size-Matic

It's done on a Heald Model 170 Size-Matic with automatic chucking and stack loading. In this highly automated setup, the bores of steel bevel gears are precision ground at an estimated production rate of 130 per hour at 90% efficiency. Loading, locating, work-holding, grinding, sizing and unloading are all performed in a completely automatic cycle. Stack loading of these awkward-to-handle parts is a definite production advantage. A self-positioning workhead permits locating gears by pitch line of teeth to a special backing plate adapter.

This Model 170 automatic loading chuck-type internal is described in Bulletin No. 2-170-1, available on request.

Whether you need high production, high precision, or a combination of both . . .

It pays to come to Heald !

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THE **HEALD** MACHINE COMPANY

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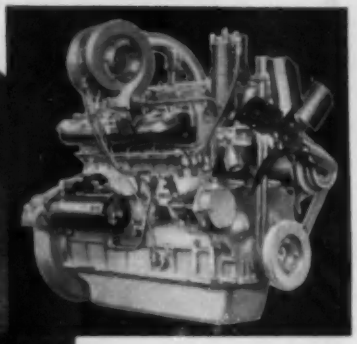
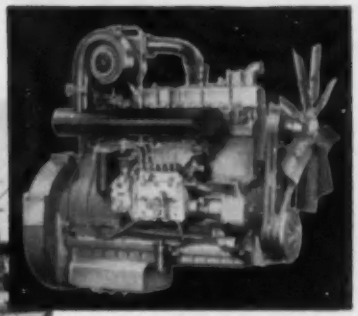
for fast, heavy hauls...



135-DKB Series DIESELS
Turbocharged (shown) **or Normal**
426 cu. in.; 100 to 187 hp.

CROSS COUNTRY

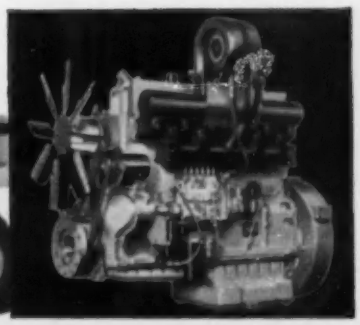
...where the pay-off is on payload—you'll make more miles and cut costs, too, with these modern feature-packed truckers' engines—Waukesha 135 Series Diesels.



148-DKB Series DIESELS
Turbocharged (shown) **or Normal**
779 cu. in.; 170 to 280 hp.

OFF THE HIGHWAY

...in and out...down and up...over and through ...go the trucks with Waukeshas—148 Series Diesels putting out the power that pulls and pays.



WAKDB Series DIESELS
Turbocharged (shown) **or Normal**
1197 cu. in.; 240 to 350 hp.

EXTRA HEAVY-DUTY

...those tremendous, crushing 30-ton, 35-ton, 40-ton loads ...up stiff grades, without faltering or breakdown ...day after day—with Waukesha WAKDB Series Diesels.

Send for Bulletins
262

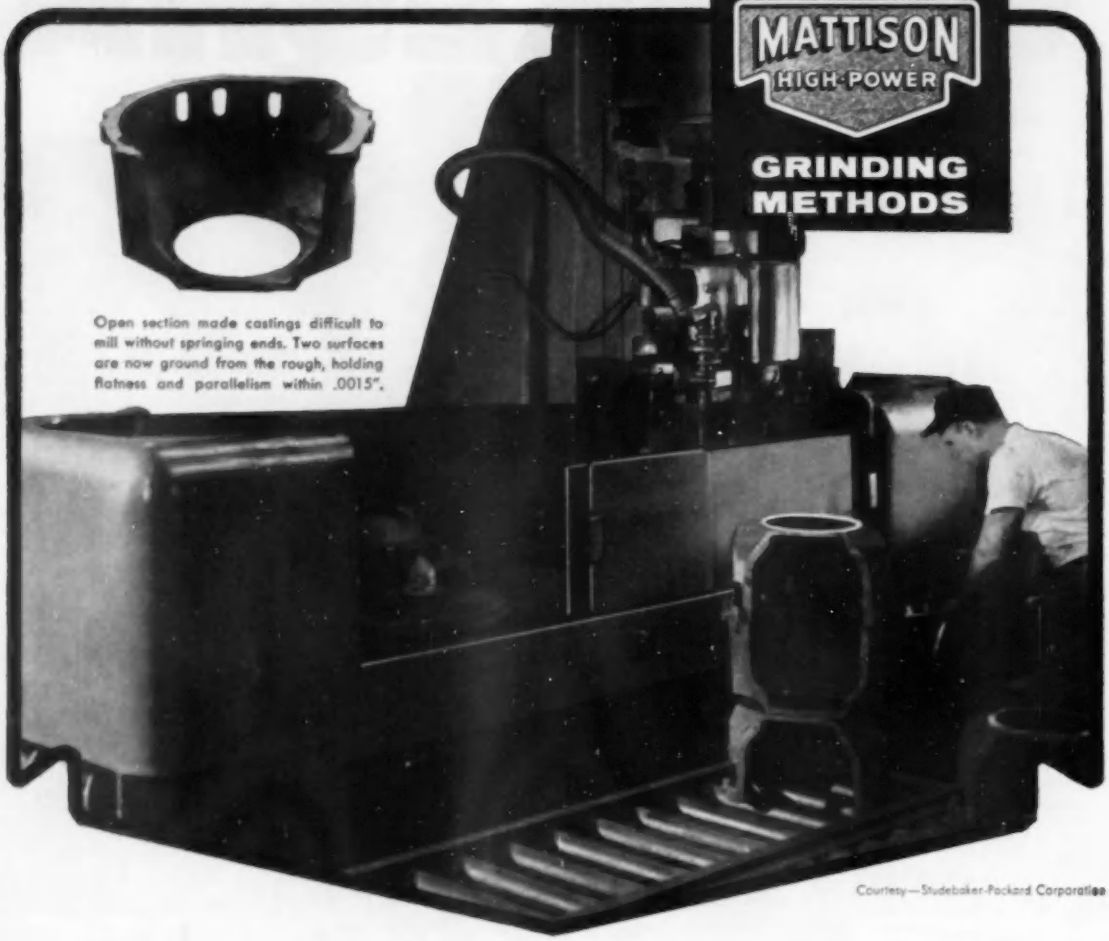
WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
New York **Tulsa** **Los Angeles**

CASE HISTORY NO. 2—TORQUE CONVERTER HOUSINGS

MATTISON HIGH-POWER

GRINDING METHODS

Open section made castings difficult to mill without springing ends. Two surfaces are now ground from the rough, holding flatness and parallelism within .0015".



Courtesy—Studebaker-Packard Corporation

Saves two milling operations . . . finish grinding difficult-to-machine casting to close tolerance

How many facing operations in your shop can be done faster, better, and at lower cost on a Mattison High-Powered Duplex Surface Grinder?

These grey iron castings, for example, were formerly milled (two cuts per surface) and then finish ground to required tolerance. Today, top and bottom surfaces are ground in one operation on a "Duplex Rotary" at the rate of 17.4 pieces per hour . . . removing .060" to .070" stock from each side . . . holding all surfaces flat and parallel within .0015" . . . *one* operator and *one* machine easily doing the work of *two!*

With two rotary tables, the Mattison "Duplex" eliminates downtime ordinarily required for cleaning and loading the table. Operator and machine are *both* more productive. This "all electric" machine is truly easy to operate . . . powered and rigidly built for heavy, multiple-pass grinding of small- or medium-size pieceparts. Why pay more for simple facing operations, or for grinding on a single-table machine, when the Mattison Duplex Rotary Surface Grinder can give you increased production, greater accuracy, and lower cost! Write for Bulletin No. 145.

Parts are rigidly supported to eliminate distortion, permitting perfect alignment when torque converter housing is assembled.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

MAY 15, 1955 — VOL. 112, NO. 10

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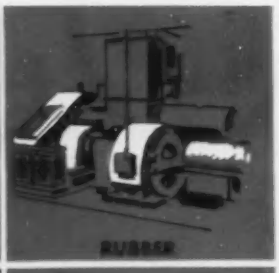

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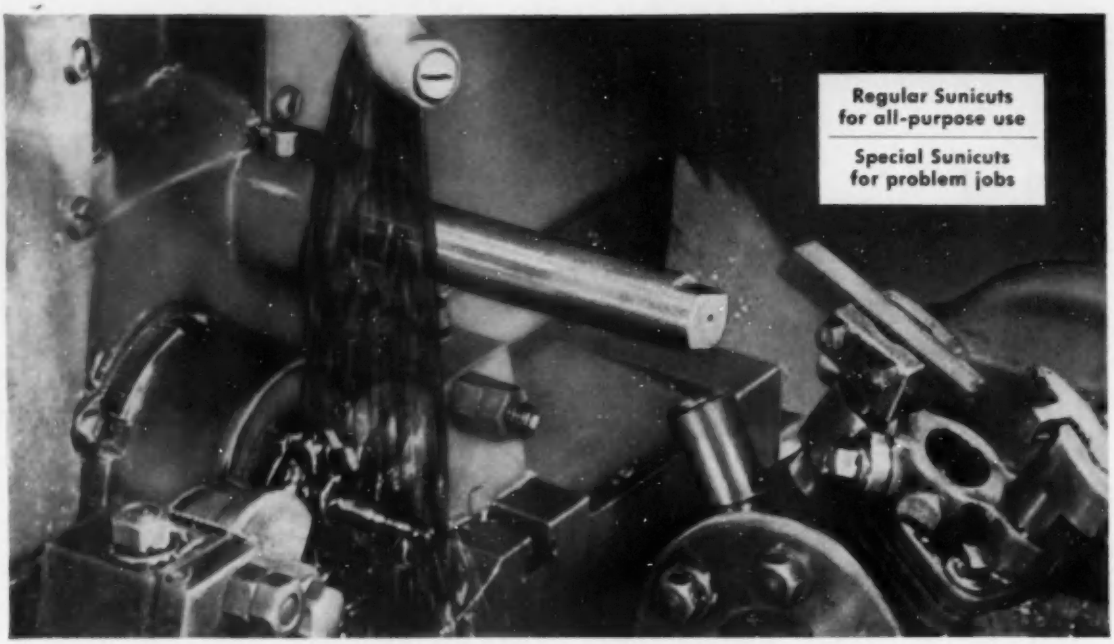

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Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

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Type K-6 Dual Lip Silicone Pinion Seal with Flange

Patent 2172325—Sept. 5, 1939
Patent 2233902—Mar. 4, 1941

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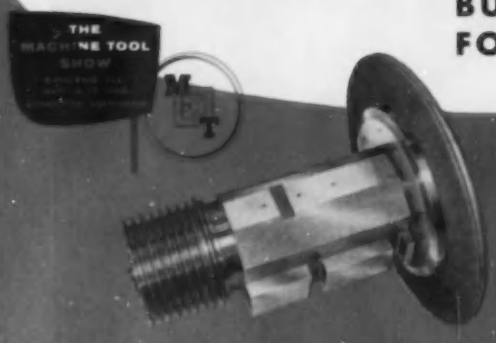
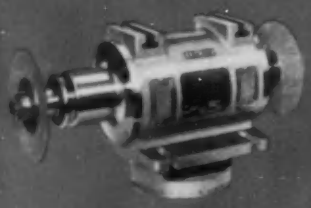
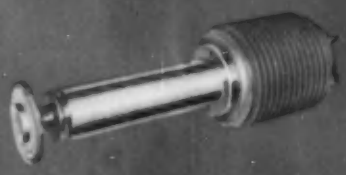


25 hp heavy duty precision spindle with 24" grinding wheel.

25,000 rpm high frequency inbuilt motor spindle.

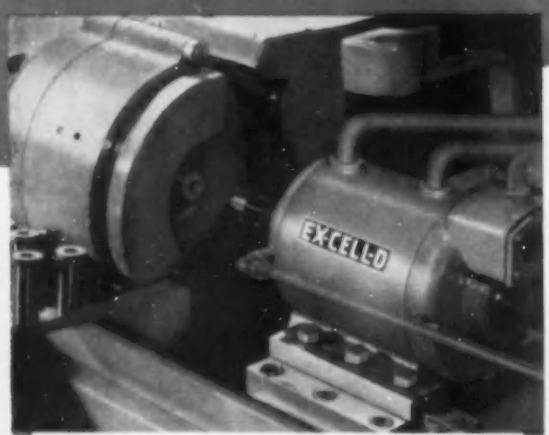


Precision inbuilt motor spindle for cutter grinder.



Totally enclosed inbuilt motor surface grinder spindle.

Heavy duty motorized precision spindle available up to 20 hp.



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XLO

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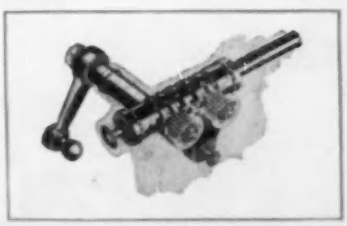

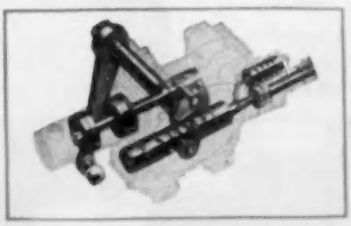

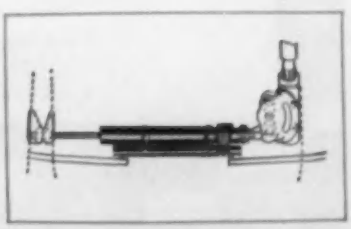

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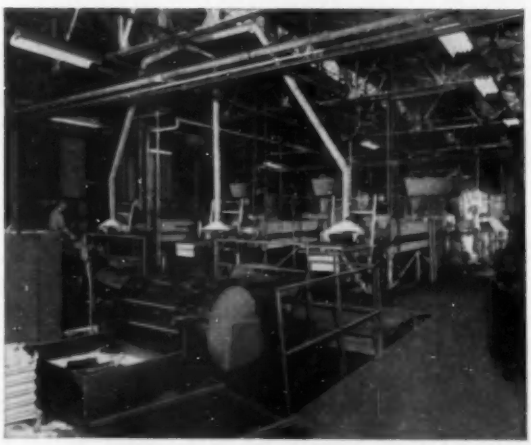
Burgess-Norton, one of the pioneers in production hydrogen-copper brazing, today serves industry with over $1,000,000 worth of diversified brazing equipment . . . utilized for an ever-widening range of components.

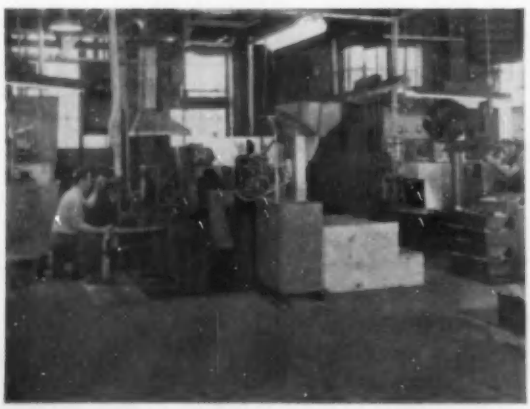
Over the past few years an increasing list of customers have found that redesigning their parts for production as brazed assemblies has made possible a new high in quality and performance, at reduced costs.

Quality is improved for many reasons . . . greater control of production and materials, closer tolerances, specialized steels in each part of the unit for specific requirements, more accurate heat treating results, greater uniformity throughout.

Costs are reduced, too, for varying reasons . . . sometimes because of the increased production possible by combining stampings and machined parts through brazing . . . or because material is saved because of the efficiency of brazed production . . . perhaps the savings are because the utilization of B-N facilities obviated installation of costly equipment, or because Burgess-Norton, one of the pioneers in production hydrogen-copper brazing, has gained valuable experience and knowledge that saves the customer through the total of many small efficiencies.

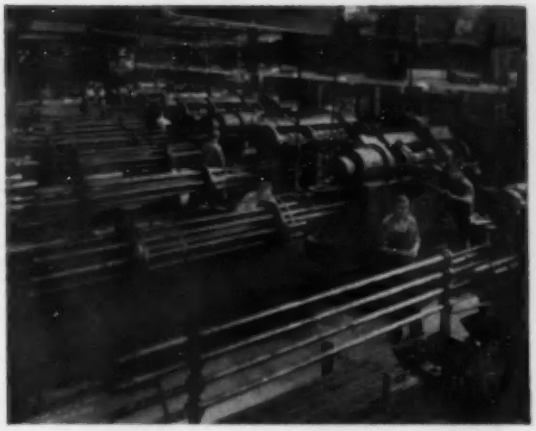
Brazed assemblies are not the answer to every parts problem, certainly, but they are being employed with advantage in more and more instances. If component parts are required in your production picture, we sincerely believe it will pay you to check with Burgess-Norton. Your inquiry will be handled promptly. If you prefer, a sales representative will call at your convenience.





The exceptional B-N heat treating facilities include both batch type and continuous fed atmosphere controlled furnaces, as well as induction heating. Burgess-Norton was one of the earliest firms to employ large scale induction heating for the treatment of metal.

Production of many of the brazed assemblies begins in the stamping department. By combining stampings and machined parts through hydrogen-copper brazing, B-N effects considerable savings in production and at the same time improves performance of the part.



This partial view of the Burgess-Norton screw machine department shows only a few of the basic machines employed in parts production. Facilities include machine tools for all secondary operations, plus a complete tool room.

These assemblies are representative of the many different parts problems that are being solved for industry by B-N engineering, production facilities and experience.

Firm in the knowledge that good parts begin long before actual production, Burgess-Norton maintains a large staff of engineers and an unusually complete metallurgical laboratory. These engineers, experienced in parts redesign for modern production methods, have been a major factor in the B-N "better parts at lower costs" story.

For a more complete picture of Burgess-Norton

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GENEVA, ILLINOIS

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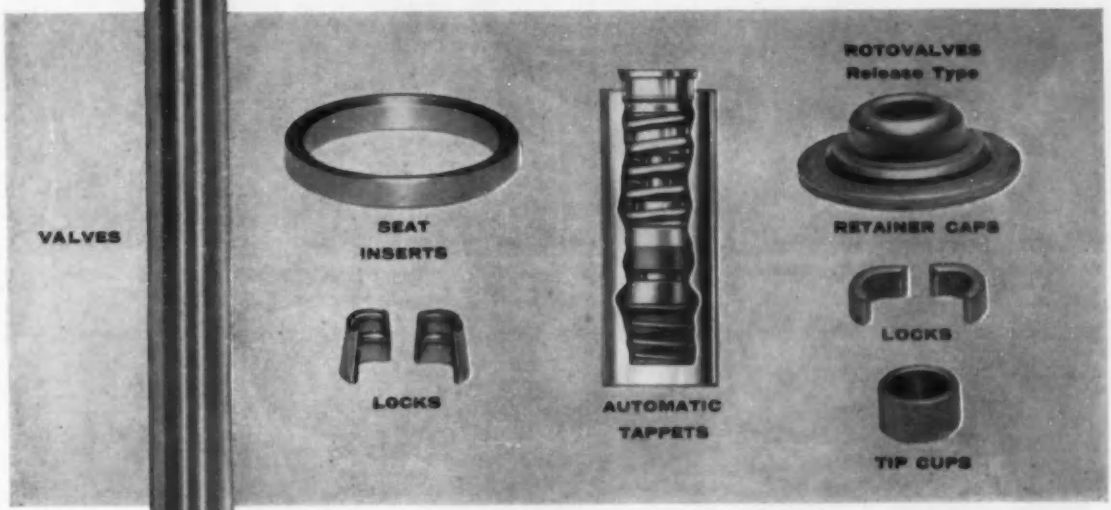
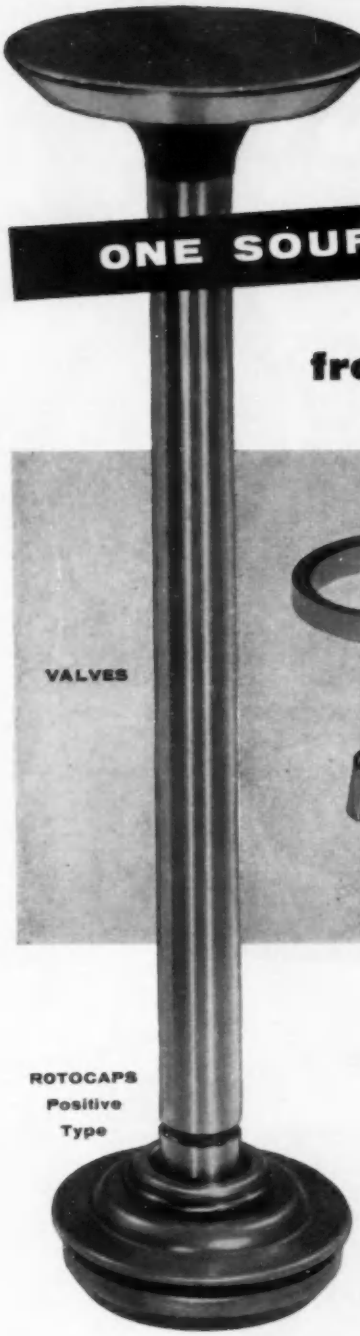
from Design to Delivery





Bring all your valve-train parts requirements to the Valve Division of Thompson Products. We are equipped with the facilities and a half-century's knowledge and experience to take it from there . . . design, prototypes, test engine runs, and finally production and delivery to mesh with your engine schedules. And we'll handle the whole job . . . valves, seat inserts, caps, locks, retainers, rotators, tappets, and camshaft design.

Take a tip from other automotive, truck, and industrial engine builders . . . let the completely integrated Valve Division supply your valve-train parts.

Valve Division of Thompson Products, Inc.

CLEVELAND 17, OHIO

if the TRUCK DEALER built the trucks he sells—

ZENITH CARBURETORS

would be *his* choice

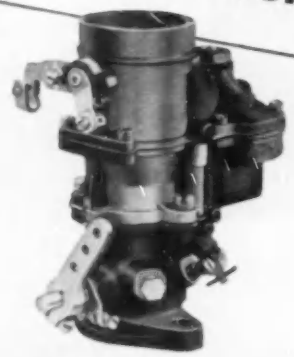
The successful truck dealer is in the business of selling customer satisfaction as well as retailing trucks. For it is obvious that unless a dealer enjoys a substantial volume of repeat business he is going to have trouble operating at a profit.

Therefore, shrewd truck dealers are vitally interested in the performance of such important components as carburetors. It is for this reason that the outstanding performance characteristics of Zenith* Carburetors, under every operating condition, have made Zenith the dealer's choice.

Therefore, it just seems reasonable that if truck dealers were engineering trucks for complete customer satisfaction, performance proven Zenith Carburetors would be their choice for standard equipment.

Further evidence why—if you build, buy, sell or operate trucks, Zenith should be your choice for the finest in carburetion.

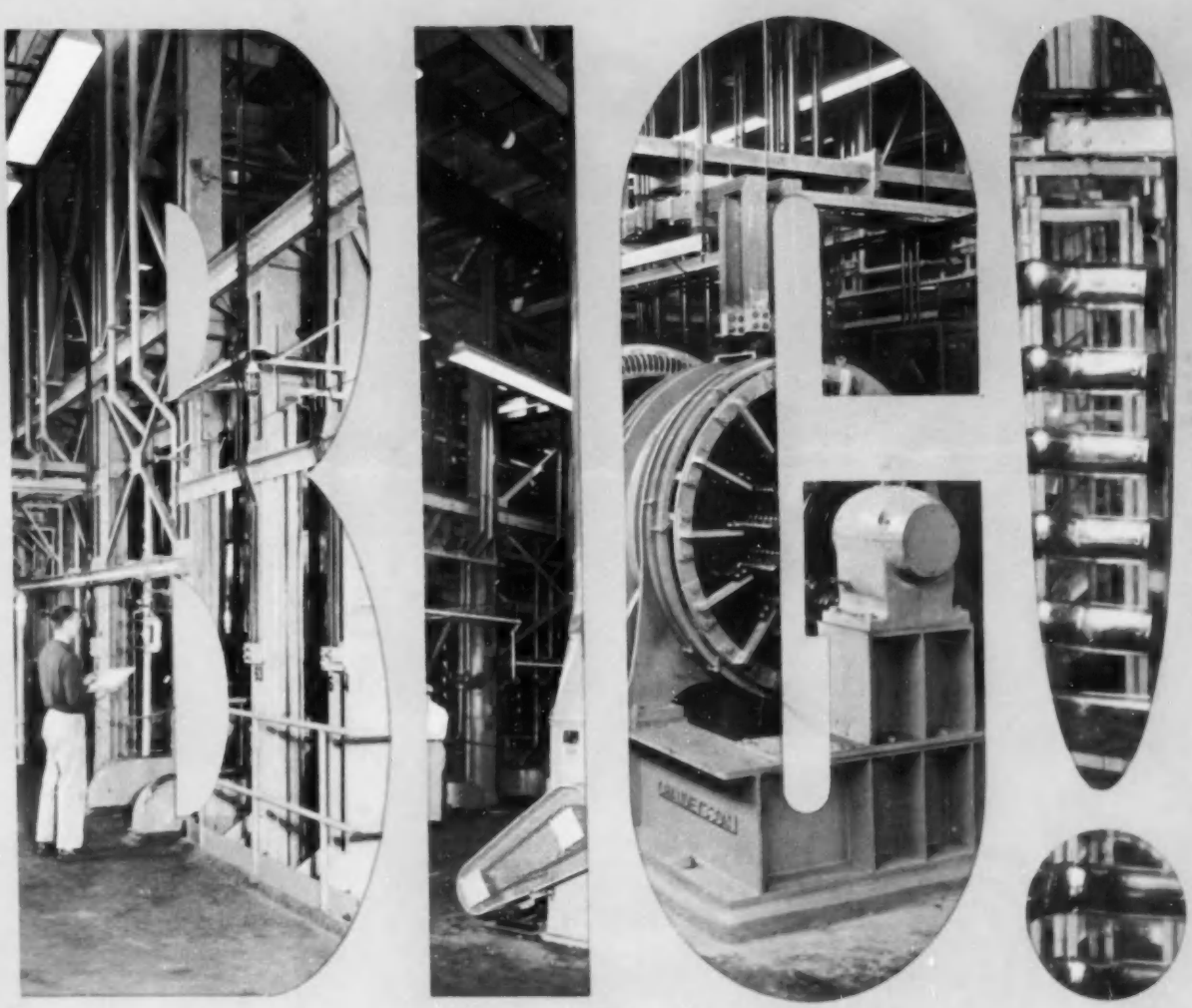
*REG. U. S. PAT. OFF.



ZENITH CARBURETOR DIVISION OF Bendix AVIATION CORPORATION

696 Hart Avenue • Detroit 14, Michigan • Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

WORLD'S *Largest* PLATING PLANT!



1 BUMPER *Every 3 Seconds—*

19,200 *Every Day!*

ENGINEERED AND INSTALLED BY THE GEORGE L. NANKERVIS COMPANY

DETROIT, MICHIGAN

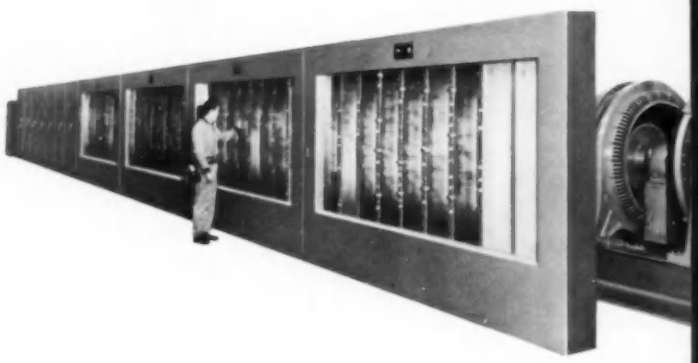
WORLD'S *Largest*

THE NANKERVIS STORY

Shortly after the first of the year, the world's largest plating plant began full-scale operation. Built for a large automobile manufacturer, this one plating plant produces all of the bumpers for their entire production.

Engineering and installation of the entire project was done by the George L. Nankervis Company, including the procurement of all the equipment required. This tremendous assignment was accomplished on a team basis by groups of top-flight Nankervis engineers, each specializing in a separate phase of the job; electrical, chemical, mechanical, civil, process piping, structural and others.

Here is the dramatic story of that installation . . . an on-the-scene look into the world's largest plating plant.



HERE'S HOW *Big* IT IS!

- ★ Produces over four acres of plated surface every 16 hours—*plates 1200 automobile bumpers per hour!*
- ★ Covers 180,000 square feet . . . the equal of three football fields.
- ★ Steel used in machine fabrication would equal that used in a 38-story office building with an area of 10,000 square feet per floor.
- ★ 906,000-gallon plating and storage tank capacity—enough to fill 109 tank cars.
- ★ Power used would illuminate 20,000 homes.
- ★ Almost ⅓ of a mile of plating machines.
- ★ More than a half million pounds of copper buss bar used.
- ★ 30 huge blowers supply ventilation—979,500 cubic feet per minute.
- ★ 710 miles of wire used in the installation of the automatic control panels and checking circuits.
- ★ Filtering rate—over 7000 gallons per minute.

COMPLETELY AUTOMATIC

Obviously a job of this size must feature complete automation. Pressing one button starts the machines and from then on it's completely automatic. Operators are required only to load and unload the bumpers.

A unique electro-graphic detector system—large illuminated panels showing the complete electrical system in schematic diagram—is used for maintenance purposes. Each point on these schematics is actually wired to its counterpart on the machine so that if trouble develops it can be spotted easily and quickly.

ENGINEERED AND INSTALLED BY

PLATING MACHINES BY MEAKER CO.

PLATING PLANT!

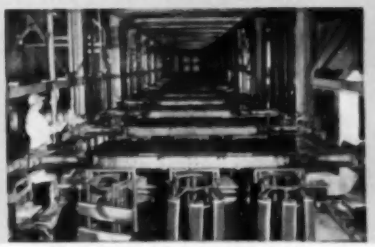
THE OPERATION

The flow chart at the right illustrates the plating cycle. Bumpers enter the copper-nickel section of the machine. Here they are conveyed through 21 different pre-cleaning, plating and rinsing operations. Under rigid quality control measures, each bumper is given a generous undercoating of copper and nickel plate.

Next, the bumpers leave the plating machine and are conveyed to the first floor for buffing. Returning automatically to the chromium section—they are sent through 10 additional processes—including the chrome plate which produces the lusterous super finish. They now leave the plating area on conveyors for delivery to the Shipping Department.

MACHINES BY MEAKER

Second Deck of Machine, Rack Return



First Deck of Machine, Racks Loaded

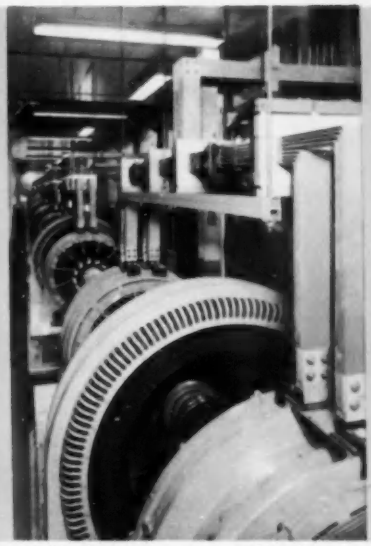
The Meaker Company designed and built the plating machines. Custom-designed for this job, they are selective, batch type machines which are unique in operation. Instead of the racks of bumpers parading through the machine, "follow-the-leader" style, the racks actually pass each other, "leap frog" style, automatically selecting the proper empty plating cell. Batch type operation permitted the use of conforming anodes which give uniform plating to curved surfaces.

Heavy duty construction was used throughout to assure uninterrupted operation at high speeds and 'round the clock duty. And of equal importance—all operating parts of the machine are easily accessible for inspection and maintenance. No "hard-to-get-at" places on these giants.

THE MEAKER COMPANY

Chicago Illinois

POWER BY CHANDEYSSON



48 Chandeysson generators—625,000 amps.

625,000 AMPERES of low voltage current required for this giant plating operation are provided by 48 Chandeysson Generators. These brute-size generators range in sizes from 7500 to 20,000 amperes.

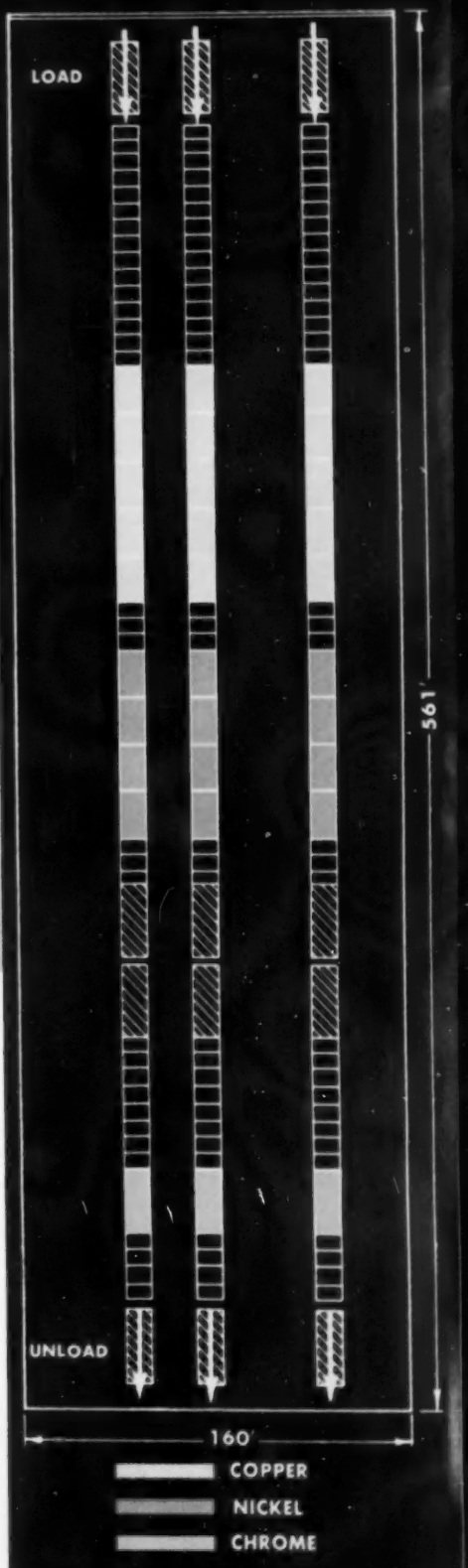
To maintain continuous production from this gigantic automatic plating machine, a dependable power supply is essential. Chandeysson generators were chosen for their reputation of high efficiency with minimum maintenance and for their ability to absorb substantial and frequent overloads without damage.

For half a century, Chandeysson has been a major source of motor-generators to the automotive industry—for 30 years supplying substantially all of the generators to this auto manufacturer—for a total of over 1,350,000 amperes.

Chandeysson GENERATORS

St. Louis Missouri

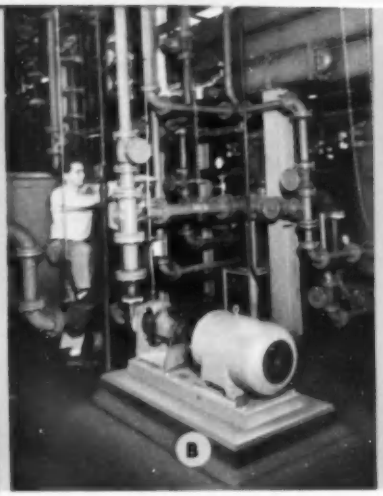
PLAN VIEW—*Plating Area*

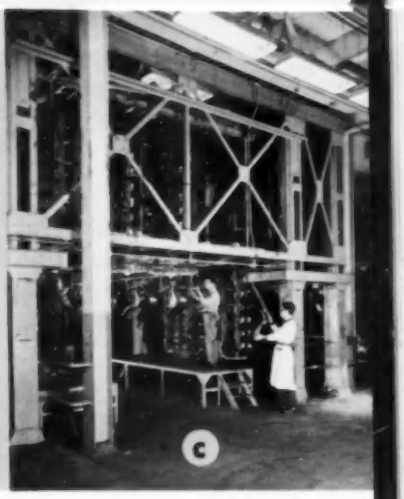


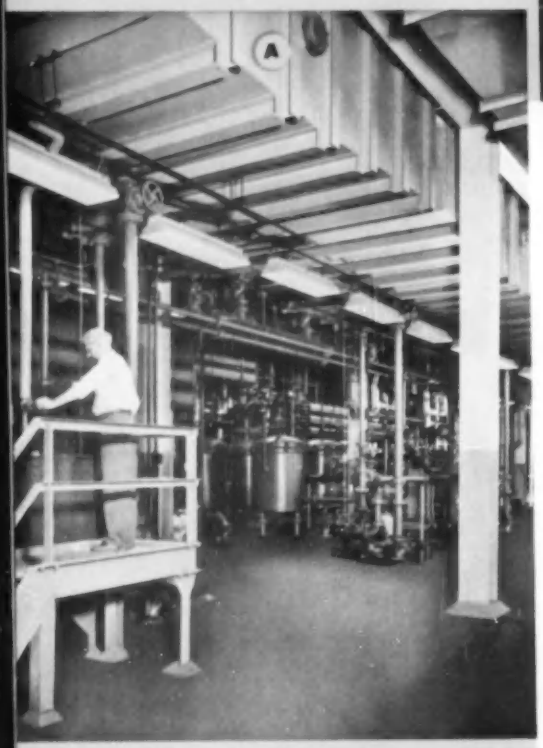
THE GEORGE L. NANKERVIS COMPANY

GENERATORS BY CHANDEYSSON ELECTRIC CO.

WORLD'S *Largest* PLATING PLANT







A TWO-FLOOR INSTALLATION: Unique installation of plating tanks—suspended through second floor—can be seen in the picture. This feature gives excellent accessibility to the plating machines above and the accessory equipment below.

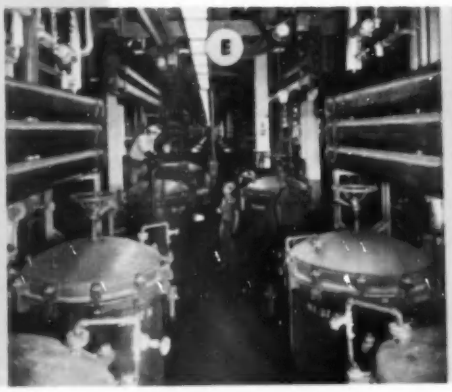
B CIRCULATION of the 430,500 gallons of copper, nickel and chrome solutions through filters and heat exchangers required an intricate process piping system—part of which is shown here.

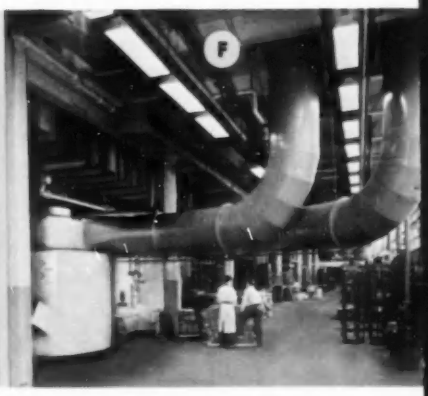
C UNLOADING: Bumpers are being unloaded on the first floor and placed on a conveyor for delivery to the Shipping Department.

D A BATTERY OF 3 MACHINES comprise the plating installation. Pictured here are the ends of the machines where the bumpers are lowered to the first floor for unloading.

E FILTRATION: 415,000 gallons of solution pass through these filters every hour—for purification—assuring good plating.

F VENTILATION of the system—at the rate of 979,500 cubic feet per minute—is accomplished with huge blowers.





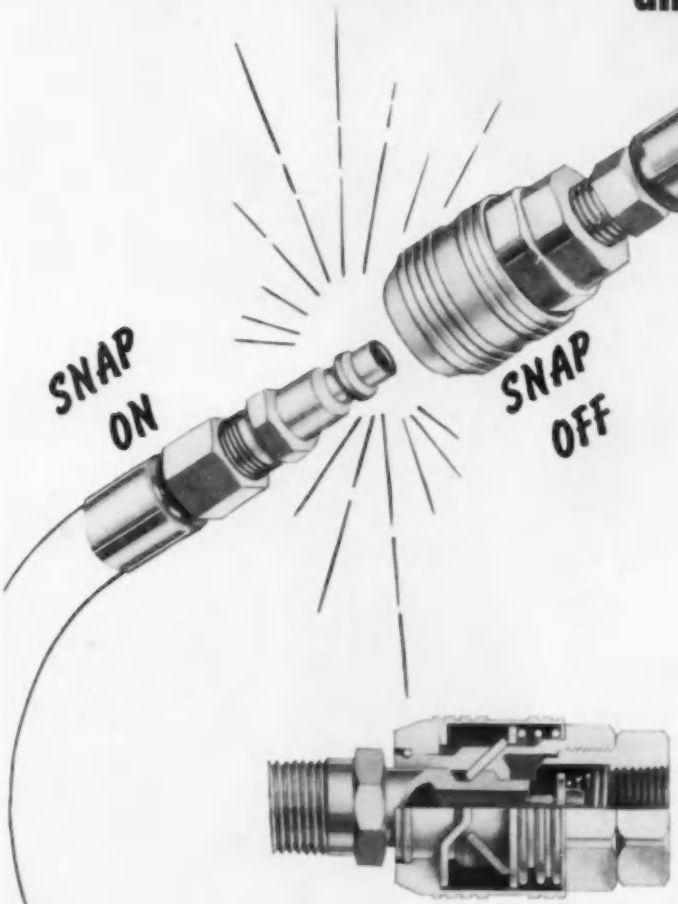
Nankervis COMPANY

EQUIPMENT AND SUPPLIES
FOR THE METAL-FINISHING INDUSTRY

19255 W. DAVISON AVE. DETROIT 23, MICHIGAN

NEW "HI-LO" SPEED COUPLERS and CONNECTORS

(HIGH VOLUME—LOW PRESSURE DROP)



"HI-LO" for *highest* air volume, *lowest* pressure drop

Better efficiency, lower operating costs for all air-operated devices.

Easy to use—snap on and off.

Swivel action saves wear on hose.

Wide selection of sizes for greater range of uses.

Leak-proof seal.

Interchangeable with many other brands of couplers and connectors.

Write for bulletin No. 5518T.

THE ARO EQUIPMENT CORPORATION
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ARO ® **SPEED COUPLERS**

Also AIR TOOLS . . . AIR HOISTS . . . LUBRICATING EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

Wheels by French & Hecht Division of Kelsey-Hayes

for the workhorses of modern agriculture

From the monsters of the fields to the highway vehicles that whisk the final product off to market —wheels are vital to the speed and efficiency of modern mechanized farming.

Making wheels for agriculture is a Kelsey-Hayes specialty that started 67 years ago at the French & Hecht Farm Implement and Wheel Division in Davenport, Iowa. **Kelsey-Hayes Wheel Company, Detroit 32, Mich.**

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World's Largest Producer of Automotive Wheels

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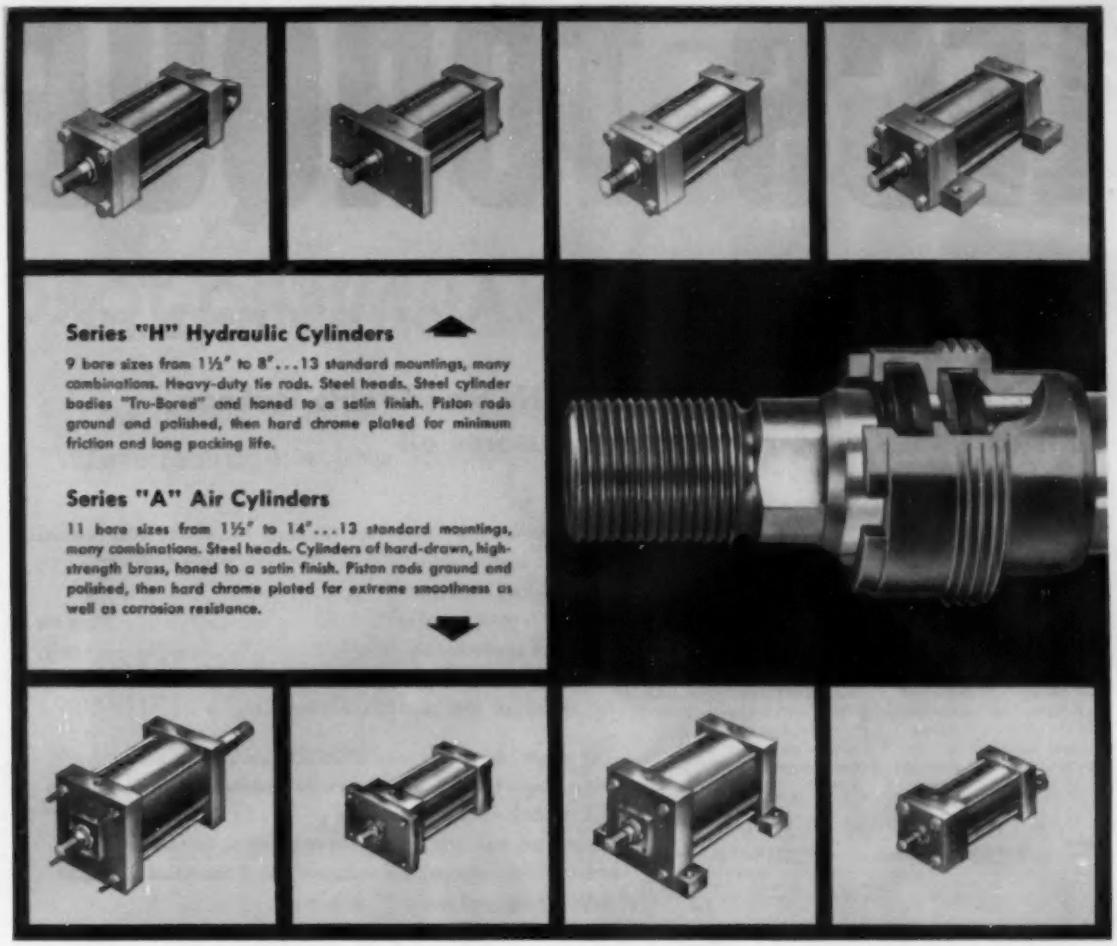

Series "H" Hydraulic Cylinders

9 bore sizes from 1½" to 8"...13 standard mountings, many combinations. Heavy-duty tie rods. Steel heads. Steel cylinder bodies "Tru-Bored" and honed to a satin finish. Piston rods ground and polished, then hard chrome plated for minimum friction and long packing life.

Series "A" Air Cylinders

11 bore sizes from 1½" to 14"...13 standard mountings, many combinations. Steel heads. Cylinders of hard-drawn, high-strength brass, honed to a satin finish. Piston rods ground and polished, then hard chrome plated for extreme smoothness as well as corrosion resistance.

Only HANNIFIN Square-Type Cylinders Have This Revolutionary New Gland

The gland you see here represents the biggest improvement in cylinder design in the last 50 years. And, you'll find this gland only in Hannifin Square-Type Air and Hydraulic Cylinders.

This exclusive Hannifin Gland is a bronze cartridge, *externally removable and replaceable as a unit* to meet J.I.C. recommendations. The packing is new, too. Outside is the "Wiperseal." It serves a dual purpose as it *wipes both ways* to provide a dry rod on the out-stroke, a dirt-free rod on the in-stroke. Inside is the "Lipseal"...self-compensating, self-relieving and nonadjustable. It provides an efficient seal throughout its long life.

Find out how easily you can apply Hannifin Cylinders to your requirements. They're available for prompt delivery—in all sizes and all standard mounting styles—and at competitive prices despite all their exclusive features.

WRITE FOR BULLETINS

Bulletin 113. Series "H" Hydraulic Cylinders

Bulletin 213. Series "A" Air Cylinders

HANNIFIN

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

LESS TORQUE

In leather—NATIONAL MICRO-TORC TRADEMARK

Lowest torque • Highest lubricity • No measurable leakage
Runs cool, lasts longer • Sealing lip stores oil

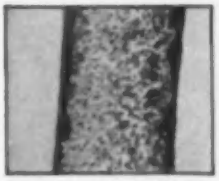

Fig. 1. National Micro-Torc Oil Seal. Oil cannot pass through elastomer coated side. Inner body retains natural porosity for "oil storage".

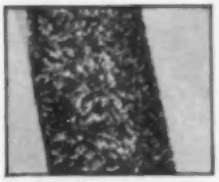

Fig. 2. Leather seal completely impregnated with rubber. Natural porosity of leather is destroyed by intense impregnation.

Shaft Size	Break Away Torque		Running Torque	
	Conventional Leather	Micro-Torc	Conventional Leather	Micro-Torc
1.500"	39 oz-in	7 oz-in	60 oz-in	36 oz-in
2.937"	126	39	253	164
3.812"	93	49	287	207

Fig. 3. Breakaway and running torque measurements, National Micro-Torc vs. conventional leather oil seals.

	NBB Micro-Torc		Completely Impregnated Leather Seal	
Test Conditions:				
Shaft Speed:	2200 RPM		800 RPM	
Shaft Size:	2.875"		2.750"	
Shaft Runout, TIR:	.003"		.004"	
Oil Temperature:	200° F.		165° F.	
Test No.	C-1643	C-1643	D-100	D-101
Total Running Time:	1017 hrs.	1017 hrs.	108 hrs.	108 hrs.
Condition after Test:				
Sealing Member:	Flexible	Flexible	Very Stiff	Very Stiff
180° Bend Test:	Surface Cracks	Surface Cracks	Deep Cracks	Deep Cracks

Fig. 4. Service life test results. National Micro-Torc Oil Seals vs. completely impregnated leather seals.

Revolutionary new Micro-Torc Oil Seals, exclusively from National, employ a leather sealing member coated on the surface with a high lubricity elastomer. This coating not only reduces torque as much as 80% but effectively prevents lubricant leakage. Since the coating is applied to the outer surface of the sealing member only, the body of the sealing lip retains its natural porosity to store oil for periods of semi-starved operation. (Figure 1.)

The appreciable superiority of Micro-Torc over completely impregnated leather seals (Figure 2) is shown at left. In addition to a marked reduction in torque (Figure 3), service life of Micro-Torc seals was test-proven to be up to 10 times the life of completely impregnated seals, and 2 to 3 times that of wax or resin impregnated seals. (Figure 4.)

In dry-running life tests Micro-Torc seals operated for 100 hours at 1,350 rpm *with no lubrication*. No squealing or sloughing was experienced, and all Micro-Torc seals remained flexible and operative.

National Micro-Torc Oil Seals are unaffected by many industrial fluids and lubricants which attack ordinary leather seals. They are recommended for application where temperatures do not exceed 200° F, shaft speeds are not over 2,000 fpm and runout is not greater than .005 indicator reading.

New! NATIONAL TORQUE METERS

New National Torque Meters provide a simple, accurate way to measure torque of oil seals. The meters are rugged, compact, easily portable, ideal for production line or receiving department. They have an easy-acting self-centering chuck for accurate seal holding, and use a simple taper-fitting test shaft you can make up in a matter of minutes. The Meters are designed for utmost simplicity, and with them unskilled personnel can make accurate torque readings with but a few moments training.

Two sizes: Model 615 fits seals up to 6" dia.; 15 lb. in. torque. Model 845 fits seals up to 8" dia.; 60 lb. in. torque.

Meters measure approximately 13" long x 10" wide x 11" high, weigh about 27 lbs. Sturdy carrying case can be furnished.

with NATIONAL OIL SEALS

In synthetic rubber— SYNTECH®

Low torque • Rubber-covered or ground O. D. • Long life
Zero leakage • Unaffected by most industrial fluids

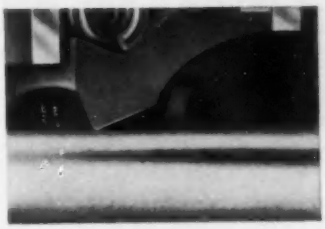

Fig. 5. Cross-section, typical National Syntech sealing lip. Note limited point of contact between seal and shaft.

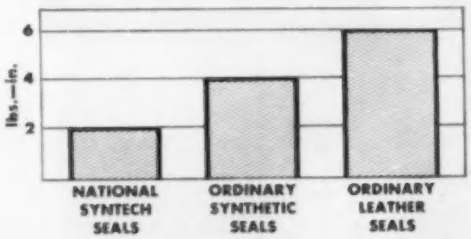

Fig. 6. Torque, Syntech vs. conventional synthetic rubber and leather oil seals. Seals tested on same shaft, under identical conditions.

Fig. 7. (Left) National Syntech Rubber-Covered O.D. (Right) National Syntech with machine-ground steel O.D.

NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS

Developed and introduced by National in 1946, National Syntech seals are among today's most widely used synthetic rubber oil seals. Their performance and dependability have been proven in thousands of commercial applications.

Syntech seals are particularly designed for higher speed, higher temperature applications where torque must be held to the absolute minimum. They feature an exclusive sealing lip design (Figure 5) which insures minimum contact between lip and shaft, yet provides zero leakage over a long service life. The marked difference in torque between Syntech and ordinary leather seals can be as much as 200%, as shown in Figure 6.

National Syntech Oil Seals are available in a wide selection of types and sizes, including seals with rubber covered or machine-ground peripheries (Figure 7) spring-tensioned or spring-less, or with twin or triple lips for special applications.

Call in a National Applications Engineer

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MORE INFORMATION?

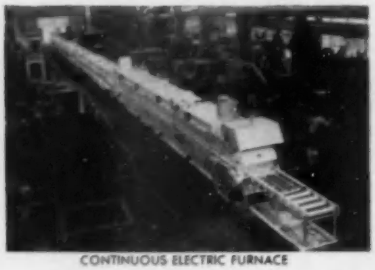
NATIONAL MOTOR BEARING CO., INC.
DEPT. D, REDWOOD CITY, CALIFORNIA

Please send complete information, illustrated technical details on
____ Micro-Torc seals ____ Syntech seals ____ Torque Meter

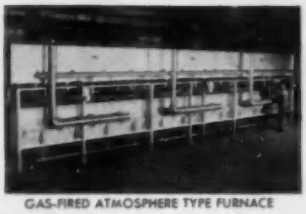
Name _____
Company _____
Street _____
City _____ Zone ____ State _____

3310

AUTOMATIC ROLLER GRID FURNACE

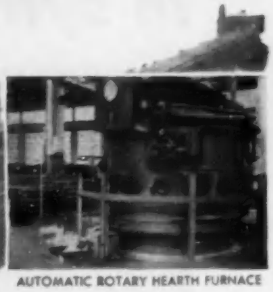


CONTINUOUS ELECTRIC FURNACE



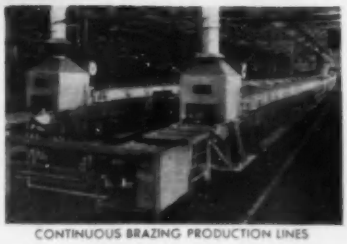
GAS-FIRED ATMOSPHERE TYPE FURNACE

BIG ONES

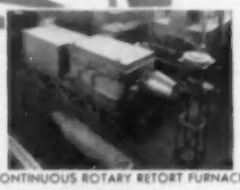


AUTOMATIC ROTARY HEARTH FURNACE

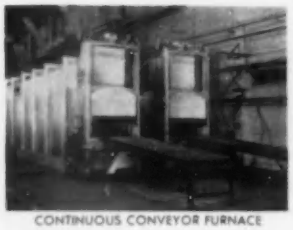
ALUMINUM BILLET HEATER



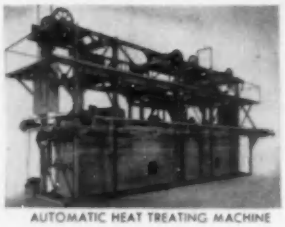
CONTINUOUS BRAZING PRODUCTION LINES



CONTINUOUS ROTARY RETORT FURNACE



CONTINUOUS CONVEYOR FURNACE



AUTOMATIC HEAT TREATING MACHINE

CONTINUOUS VITREOUS ENAMELING LINE

. . . all field-erected by Lindberg

Maybe you haven't heard the news. Lindberg is now set up to field-erect any type of industrial heating or processing installation. Here are just a few of the large field-erected installations already put up by Lindberg. More are being built right now.

You get a complete package deal from Lindberg. Expert engineers consult with you and analyze your needs. Then they plan and design an installation to meet your specific requirements, whether you need a single furnace or a complete production line. And Lindberg will build it for you, right in your own plant.

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this double-ram vertical

LAPOINTE BROACHING MACHINE

with electro-mechanical drive

lends itself to carbide tooling because of its

higher speed ranges

here's BROACHING EFFICIENCY at its best!

Simultaneous broaching of rotor wheel slots and mating buckets (the latter requiring two progressive operations).

. . . that's balanced production!

125 broaching cycles per hour, at 80% efficiency, producing these parts faster than by any other known method.

. . . that's volume production!

No loss through rejections, because all parts are formed perfectly and to the close tolerances required of jet engine components.

. . . that's quality production!

One operator easily and safely handles this double ram machine, loading one ram while the other ram is broaching.

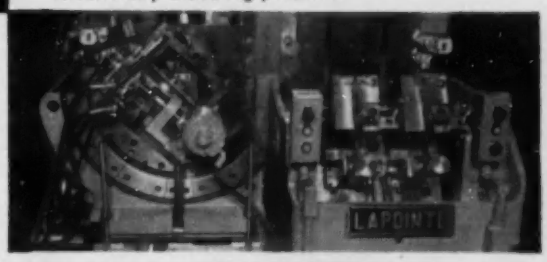
. . . that's efficient production!

FOR 53 YEARS LAPOINTE has been designing, engineering, and building broaching machines, tools and fixtures. That's all we do. It's no wonder that production men most naturally look to Lapointe to solve any broaching problem.

TWO UNIQUE FIXTURES

make this high production possible, the Lapointe IN-and-OUT self-indexing type for the rotor wheel slots (see ram on left), and the TIP-DOWN type for the mating buckets (see ram on right). The Tip-Down type fixture is exclusive with Lapointe.

If you would like a description of this LAPOINTE double-ram vertical broaching machine ask for Bulletin DRVE-10



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Newton Vertical
Rotary Milling Machine

NEWTON

CONSOLIDATED MACHINE TOOL

A Division of Farrel-

TWO IN ONE

Here is a Newton Vertical Rotary set up for milling diesel engine oil pans. The head feeds along the cross-rail and mills the piece in one pass.

At the end of the cut, the spindles unclamp and retract. As the head returns to its starting point on the cross-rail, the table is automatically power indexed. The spindles lower and clamp and the next pan is milled.

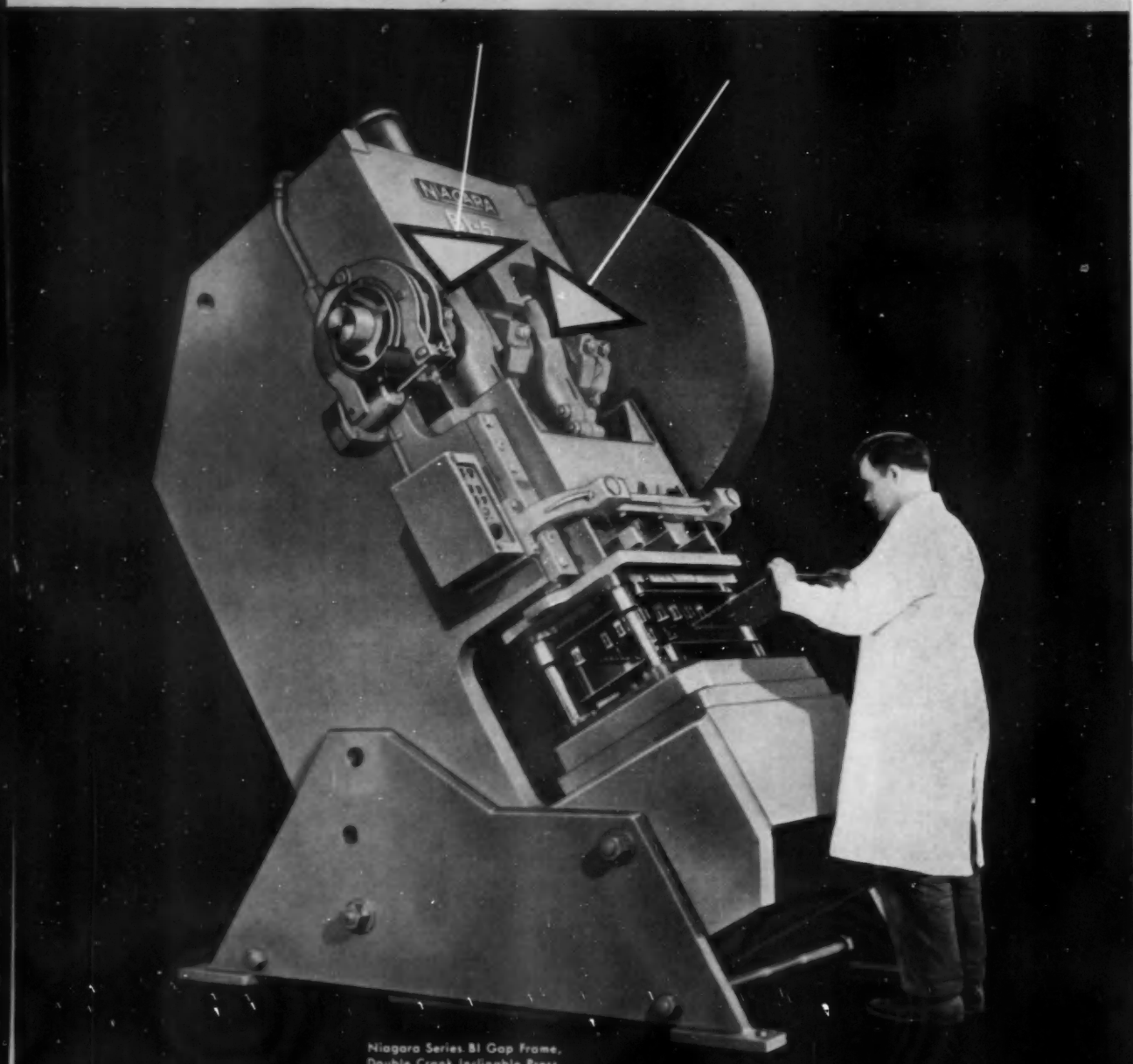
This machine may run several weeks on oil pans. Then, by locking the head on the cross-rail and engaging the rotary table feed, it becomes a continuous rotary milling machine for an entirely different type of job! (Fixture change-over time—less than one hour.)

Two entirely different machines for not much more than the price of one. A good example of Consolidated's utility minded engineering.

COMPANY, ROCHESTER 10, N. Y.

Birmingham Company, Incorporated

NIAGARA 2 POINT tomorrow's



Niagara Series 81 Gap Frame,
Double Crank Inclinable Press.

INCLINABLES

design for today's production needs*

From crown to base . . . *taking in every part and operating feature* . . . the Niagara Double Crank Inclinable Press Series stands alone in advanced engineering. By record and by reputation, this is the press with the best future for cost-cutting, production-boosting, *long die area work.*

*** LONGER LIFE FOR LONG DIES**

Niagara's double crank design resists tilting of the slide under off-center loading, thereby reducing misalignment of dies. Rugged, welded steel plate, box type slide rigidly supports punches. Heavy duty, rigid, integrally built frame properly resists deflection, maintaining permanent alignment of bearings and slide.

FASTER WORK HANDLING

Die area is accessible from *all* sides. Work may be fed from either side or front-to-back with equal facility, and is quickly discharged by gravity through the unobstructed opening in the back when the press is inclined . . . *yes, even long work!*

GREATER VERSATILITY

A tremendous variety of blanking, perforating, forming and drawing operations can be performed, with emphasis on work requiring long die areas. All presses in the series are designed to readily accommodate pneumatic die cushions which Niagara furnishes complete with accessories and fittings.

HIGHER PRODUCTION RATE

Optionally equipped with automatic feeds and variable speed drives, Niagara 2-Point Inclinables are well suited to large quantity production and long, continuous runs.

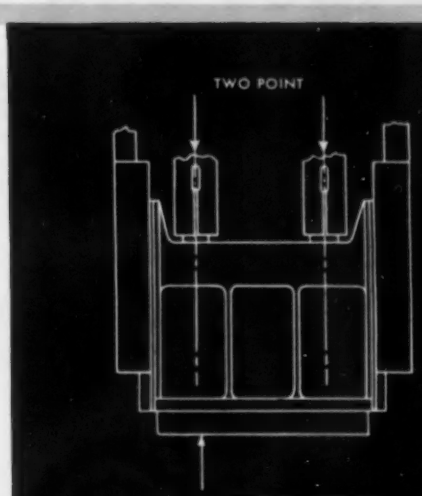
MORE ECONOMICAL MAINTENANCE

Features that spell *stamina* and *ruggedness* . . . welded steel plate frames with box section crowns and deep beds forming rigid ties between uprights; welded steel plate, box type slides; precision "V"-flat gibs; bronze bushed main bearings; self-aligning ball-seat connections; Niagara electro-pneumatic and mechanical sleeve clutches . . . all combine to keep maintenance at a practical minimum.

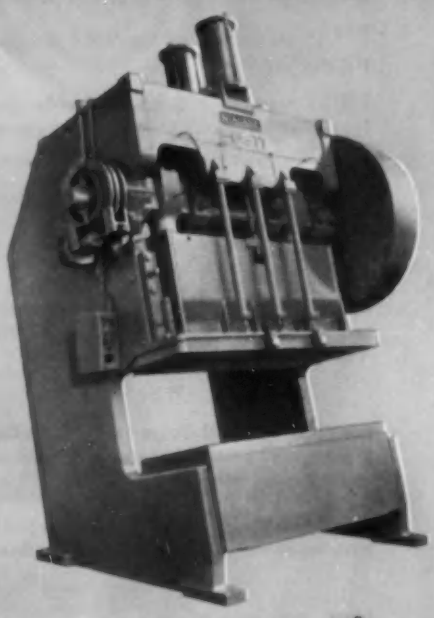
• • •

Standardized in capacities from 65 thru 222 tons, Niagara Series BI Double Crank Inclinable Presses are your most logical answer to long die area work. For still longer requirements, Niagara builds a complete line of permanently inclined or upright Series B Presses.

Obtain complete details on *all* the noteworthy Niagara features by requesting Bulletin 65. Consult with a Niagara engineer about *your* problems.



Off-center load resisted directly by two connections.



Niagara permanently inclined, gap frame, double crank press.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

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America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

TRADITIONALLY
FIRST and FOREMOST
in SPARK PLUG design...

FIRST with the one-piece heat-sealed shell construction.

FIRST in welded side electrode construction for better heat and electrical conductivity.

FIRST to incorporate a resistor element for elimination of radio interference from ignition.

FIRST with fused metal-ceramic seal to stop center-wire compression leakage.

FIRST in the use of unglazed insulator tip to resist lead attack.

FIRST with the aluminum oxide insulator in the United States—a patented AC composition!

FIRST to use greater "scavenging" area between insulator and shell. For example: Has been used in AC type 48 plug since 1944.

FIRST with the long, thin, recessed, quick-heating insulator tip—the AC Hot Tip—*an AC exclusive!*

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For More than 20 Years Every American Make of Car and Truck has been Equipped with One or More AC Products.

If you need help in solving a tough problem, write or call one of the AC offices.

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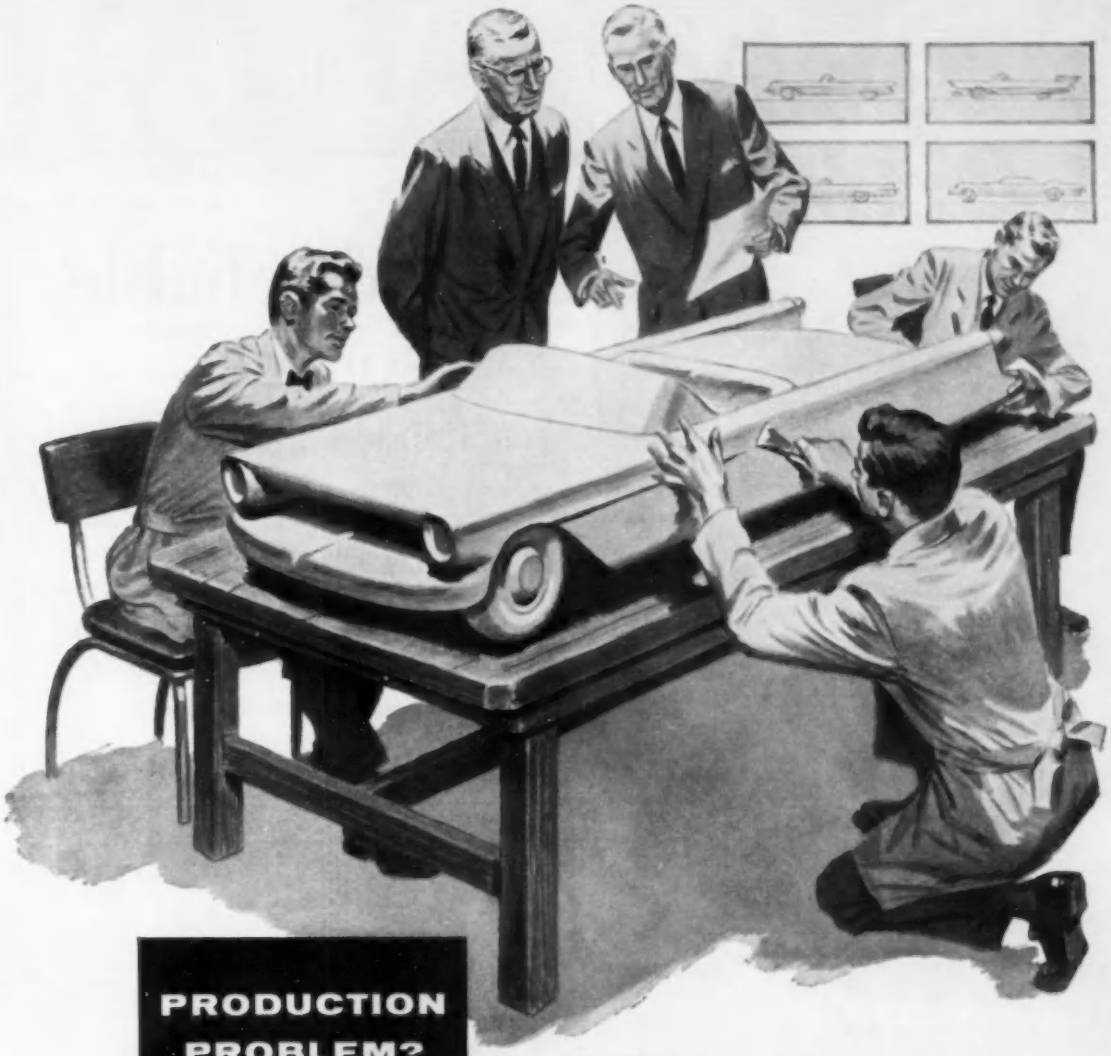
AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

GM GENERAL MOTORS

AC QUALITY PRODUCTS



PRODUCTION PROBLEM?

if you use flat-rolled steel talk to a specialist

PROBLEM With present designs and manufacturing facilities, the auto industry needs wide coils of sheet steel with a minimum number of welds. These welds must be cut out before steel goes into the big presses—a costly, time-consuming process.

SOLUTION As a prime supplier to the automotive and other industries, Great Lakes Steel has developed facilities which now produce wide coils of steel in greater lengths . . . drastically reducing the number of expensive welds in each coil. Result: important fabrication savings for our customers.

MORAL Whether you make autos, appliances, or farm machinery . . . if it's flat-rolled steel, you can't lose by talking to Great Lakes Steel—specialists in flat-rolled production and application for 25 years.

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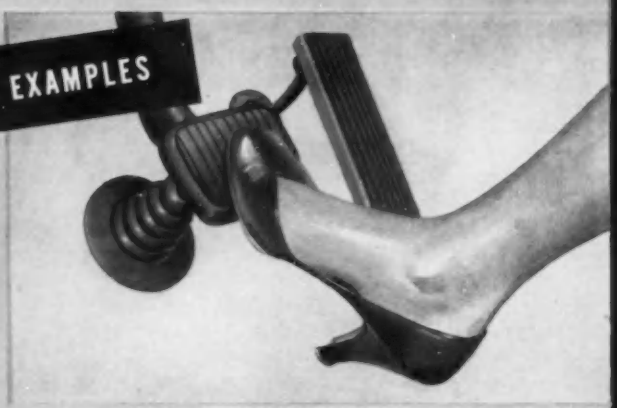
A good reliable source

FOR AUTOMOTIVE EQUIPMENT

From four wheel brakes to the latest development in power braking, Bendix Products Division has demonstrated its unique ability not only to keep pace but *actually to anticipate* the industry's requirements for the latest and most efficient in automotive components.

TYPICAL EXAMPLES

BENDIX LINKAGE TYPE POWER STEERING—Because Bendix* Power Steering is of the linkage type, manufacturers find it especially adaptable for production line installation without extensive engineering changes. Manufacturers can now meet the ever-increasing demand for power steering more efficiently and more economically with Bendix Linkage Type Power Steering.



BENDIX LOW PEDAL POWER BRAKE—Specified by more car manufacturers than any other make, Bendix* Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from the go to the stop control. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety.

*REG. U. S. PAT. OFF.

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BUSINESS DEPARTMENT

Jack C. Hildreth, Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
E. W. Hevner, Circulation Mgr.
John R. Flood, Market Research
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone GRanite 4-5600

REGIONAL MANAGERS

CHICAGO—John T. Hoole
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DETROIT—Melvin B. Nylund
1015 Stephenson Bldg.
Detroit 2, Mich.
Phone TRinity 5-2090

PHILADELPHIA and NEW YORK—
Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone GRanite 4-5600
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

CLEVELAND—Richard P. Keine
730 National City Bank Bldg.
Cleveland 14, Ohio
Phone CHerry 1-4188

SAN FRANCISCO—
R. J. Birch and Frank W. McKenzie
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Phone DOuglas 2-4393

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3156 Wilshire Blvd.
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High Spots of This Issue

★ **Many Special Cars at Turin Show**

Approximately 450 exhibitors, representing 13 nations, were on hand with their products at the recent Turin International Automobile Show. Outstanding new features of the vehicles on display are described and illustrated here. See Page 52.

★ **Engineering of Ford Rotary Heat Exchanger**

One method of improving the specific fuel consumption of a gas turbine engine is the introduction of a practical heat exchanger. This article deals with a prototype rotary regenerator which has been developed by Ford Motor Co. Page 54.

★ **Pre-Race Engineering Activities for Indianapolis**

Spotlighted in this report are many of the interesting questions being raised prior to the speed classic at Indianapolis on May 30. In pointing out engineering features of some cars, the author hints at what may be expected. Page 58.

★ **Aluminum Applications in Automatic Drives**

Many practical and economic uses have been found for aluminum alloys in today's automatic transmissions. Among their large users are Lincoln and Mercury cars, and studied here are their applications and machining by Ford. See Page 62.

★ **New Packard Machines for Crankshafts, Camshafts**

Continuing his study of the new Packard plant at Utica, Mich., the writer now turns his attention on the highly automated crankshaft and camshaft lines. Operations of the machines are described and profusely illustrated in the story. Page 70.

★ **61 New Product Items**
And Other High Spots, Such As:

Special cylinder liner setup; new planetary drive; mergers and monopoly; aircraft components spun; Westinghouse machine tool forum; Cadillac's plating plant; SAE aeronautic meeting; Materials Handling Show; reground ball bearings; automobile headlamp history; and gas turbine combustion development.

Automotive and Aviation News, Page 37
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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Seamless or welded? Hot or cold rolled? Round or square? Whatever the type, size and wall thickness—you get what you need, quickly, when you call Ryerson for tubing.

That's because our tubing stocks are so large and diversified—are, in fact, the nation's largest. And because we have *a tube for every use* you can be sure of completely unbiased recommendations when you consult Ryerson specialists on tubing problems.

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You can rely on Ryerson for prompt personal attention—for quality steel accurately cut to specification—for quick delivery from stock. So, when you need tubing—and any other steel product—call Ryerson.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 112, No. 10 May 15, 1955

Added Ford Expansion Lends Weight to Talk of New Car

Ford Motor Co. plans to spend an additional $625 million during the next three years on new plants and equipment. The expansion program, coming shortly after changes in the organizational setup to create a new Special Products Division, is a further indication that the company may add at least one new model to its present line of cars.

While no further details have been revealed about the newest expansion program, it is highly possible that a major portion of the expenditure will be used for the construction of at least two new major plants. One would be for Lincoln Div. which was recently separated from Mercury, and another for what has been designated the "E" car.

It is certain that some existing plants also will be expanded. The previous postwar expansion outlay of $1.7 billion, according to Henry Ford II, "still has not given the company enough production capacity to keep up with demand."

Automobile Makers Continue To Shatter Output Records

Automobile production records continue to tumble week by week for both the industry and individual companies. The big question is how long the current output and sales boom will last.

The industry is now producing at an annual rate of nearly 9.5 million cars. It turned out its three millionth car, the first week of May, about two months ahead of 1954. Latest estimates are for sales of 6.5 to 6.6 million cars this year.

Production records were shattered by the Big Three for the first four months. Several makers are scheduling even higher rates this month to indicate another industry production record.

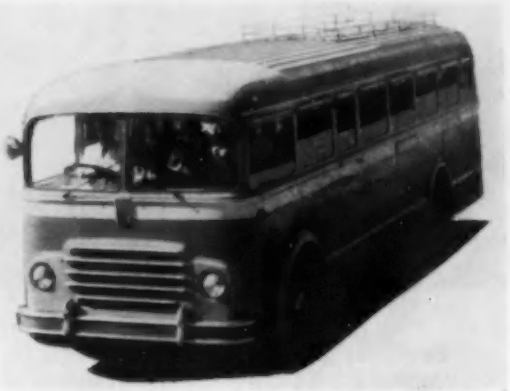
Bolstered by a new high monthly output in April, GM wound up a record four-month period with 1,630,974 cars and trucks. This figure was more than 364,000 units higher than the previous four-month high set in 1953.

For the first four months, Ford output totaled 892,379 units, compared with 735,137 in the like 1954 period. Chrysler output soared to well above 581,000 vehicles, more than double that for the same period last year.

Several other production milestones were recorded by automobile manufacturers last month. Ford, on April 20, turned out its millionth 1955 model car, only a few days after Chevrolet rolled out its millionth unit. The former was built in fewer than six months after production started.

FIAT BUS

The new Fiat 57-passenger 682 RN bus is 34 ft, 7.35 in. long; eight ft, 1.5 in. wide; 10 ft, 4.8 in. high; and has a wheelbase of 18 ft, 2.4 in. Power plant is a six-cylinder Diesel engine with an output of 140 bhp at 1800 rpm.



Big Three Line Studies Torsion Bars for 1957

Torsion bar suspension is reported to be a likely prospect in one of the Big Three volume lines in 1957 models. It would probably not, however, include a leveling device such as is currently being used by Packard.

Chrysler Sales, Earnings Soar During First Quarter of Year

Earnings of Chrysler Corp. for the first three months were nearly five times higher than those in the like 1954 period. They amounted to $34.5 million, compared with $7.6 million last year.

The profit for the quarter far surpassed total earnings of $18.5 for the entire year of 1954. Sales for the first three months totaled $958 million, nearly double those for the same period last year.

Shipments of cars and trucks during the quarter topped those of any previous first quarter in totaling 454,948 units. In the same period of 1954, shipments were only 228,087 units.

Chrysler retail sales for the first three months accounted for 18 per cent of the total industry market. This was an increase of about four per cent over the comparable 1954 period.

Defense work during the quarter dropped from $72 million last year to $35 million. Capital expenditures for new and improved facilities were $15 million in the period.

News of the AUTOMOTIVE

SNOW REMOVER

This tractor-mounted snowblower, manufactured by Dominion Road Machinery Co., Ltd., is said to load up to six tons of snow a minute. Two rotating fans blow snow through a discharge chute into trucks alongside of the tractor. Spiral augers ahead of the fans break up the heavy snow and pull it back into the blower. A 38-hp Ford gasoline engine at the rear of the tractor operates the blower by means of a shaft drive and balances weight of the blower at the front.

Chevrolet Rolls Out Millionth 1955 Car

Chevrolet on April 21 built its millionth 1955 car in approximately 6½ months, a new record. The GM division did not indicate how long it took to produce the same number of 1954 models. If the present rapid production pace continues, Chevrolet, along with other producers, may well reach a new yearly production peak in 1955.

Chevrolet has been setting records of one kind or another since the beginning of the year. On January 31, it broke a daily record with output of 8350 units and set a weekly production mark shortly after that on February 19 with 40,169 units. Similarly, March output of 173,031 cars broke all previous monthly records as did the first three months combined, when a total of 481,041 units was turned out.

Transistorized Philco Radio To be Offered by Chrysler

Chrysler Div. of Chrysler Corporation is the first automobile producer to offer a radio employing transistors to replace conventional vacuum tubes. It will be available as special equipment on Chrysler and Imperial cars next fall.

Developed by Philco, the new radio draws relatively little battery current, according to E. C. Quinn, Chrysler Div. president. It has 11 very small transistors which reportedly exceed the life of the car.

The new radio is said to require no warm up period, and its sensitivity, selectivity, and power are high. Size of the chassis is comparatively small.

Since the transistor radio employs a maximum of only 12 volts, it will reduce importantly the current drain on the battery, according to Mr. Quinn. Furthermore, it draws current in direct relation to volume.

Mr. Quinn estimates the radio will run continuously for 140 hours on a fully charged 12-volt battery. Current drawn is estimated at 0.2 to 0.3 amps.

Factory Sales of Vehicles Hit Peak in First Quarter

Official figures compiled by the Automobile Manufacturers Association show that motor vehicle factory sales hit a record during the first quarter. The domestic and export total of 2,364,918 units included 2,104,498 cars, 259,729 trucks, and 691 coaches. The above figure surpassed by 117,250 the previous quarterly record set in the third period of 1950, the best year for the industry as a whole. Export sales totaled 123,727 in the first quarter, compared with 105,566 in the corresponding 1954 quarter.

Daimler-Benz to Set Up Unit In U. S. for Vehicle Output

Daimler-Benz A.G. — well-known German manufacturer of Mercedes-Benz trucks, buses, tractors, marine and Diesel engines, and passenger cars—has announced plans for the establishment of facilities in the U. S. for the assembly and/or manufacture of some of its products. The location of the new operation, to be known as Daimler-Benz of North America, Inc., has not as yet been revealed. It is expected that a subsidiary company will also be set up in Canada.

Initial output, which should get under way some time this year, will be concentrated on Diesel trucks, probably in the medium-duty class. Plans call also for the making of tractors, specialized Diesel engines, and perhaps passenger cars later. It was emphasized, however, that sports cars are not included in the U. S. program.

Air Force Heavy Press Program Gets Underway at Alcoa Plant

By pushing two buttons, Air Force Secretary Harold E. Talbott put into production May 5 two huge 35,000 and 50,000-ton hydraulic forging presses at the Cleveland Works of Aluminum Co. of America. It thus became the first complete plant of the Air Force's $279 million Heavy Press program to go into operation.

The presses, which weigh more than 6000 tons each, will be used to forge heavy precision aircraft components. The 35,000-ton press was built by United Engineering and Foundry Co., while the 50,000-ton unit was constructed by Mesta Machine Co.

Chevrolet Claims Record For Daily Car Production

Chevrolet broke a daily production record on April 28. On that date, the GM division turned out 10,080 vehicles, which included 7902 cars and 2178 trucks. The division claims the new daily high output tops all previous records established by any other volume automobile producer.

AND AVIATION INDUSTRIES

Used Car Guarantee Plans Launched by Two Makers

Nash and Packard have introduced used car guarantee plans aimed at increasing the public's confidence in dealers' used cars and boosting resale values and sales of older units. The Nash program, backed by a $1 million indemnity bond, certifies that if the dealer does not comply with the used car warranty, the factory will do it.

The Nash guarantee is the standard 50-50 thirty-day or 1000-mile plan. New features, however, are the doubling of the warranty period to 60 days or 2000 miles on used Nash cars, and the factory compliance provision. If a dealer defaults, Nash will designate another dealer to the job at company expense.

The Packard plan is restricted to late-model, one-owner Packards. It features voluntary testimonials from former owners and a 100 per cent warranty for the replacement or repair of engine, differential, and transmission parts for 2000 miles or 45 days.

DuPont Co. Develops A New Titanium Metal

A new and lower-price titanium metal for use as an addition agent in production of ferrous and non-ferrous alloys has been developed by DuPont Co. Called titanium metal-grade NDA, the metal comes in the form of pellets and sells for $1.75 a pound. "Fines," spongy particles used in special processes, are priced at $1.50 a pound.

UAW Firepower Is Directed More and More Toward Ford

Two moves made by the UAW-CIO early in May clearly indicate that Ford will be the major target of the union in its drive for a guaranteed annual wage and other benefits in negotiations currently under way.

The union notified GM, whose current contract expires May 29, that it was terminating the agreement as of June 7. Since the Ford contract expires June 1 and the union earlier had served notice of termination as of that date, Ford will be vulnerable to strike action six days ahead of GM.

MIDGET SCOOTER

Small scooter, made in Sweden by O. Mustad & Son, weighs only 66 lb. Its 1.3-hp, two-stroke engine chain-drives the rigid front wheel. Gas tank is mounted on the steering column under the handlebars. Rear wheel is suspended on swinging arms carried in bonded rubber bushes. The manufacturer supplies a pair of carrier brackets which pivot under the rear of a car. Scooter can be easily dismounted for cruising in city traffic when car is left in the less-congested suburbs.

Furthermore, Walter Reuther had personally started to participate in the negotiations on April 29. This appeared to be further evidence that the talks were getting into the serious stage.

One consideration in selecting Ford for a showdown is that the union currently is collecting a $5 monthly strike assessment. The fund can be built up much faster by leaving the larger number of dues payers at GM working than would be the case if GM were to be closed down first.

Negotiations continue with General Motors, but all signs point to the big effort being made with Ford. So far very little concrete information has come out of the meetings with the exception of one report from the union that Ford had come up with a counter offer. There were no details available, however, and Ford refuses to comment.

Meanwhile, negotiations on a new contract, including a guaranteed annual wage, between American Motors and UAW-CIO have slowed to a walk. There has, however, been an agreement that the present contract will be extended to August 12.

Part of the AMC contract is scheduled to expire June 1 and the balance by July 1. It is the apparent intent of the union to set a pattern at Ford or GM before making any commitments with smaller companies.

Chrysler to Offer Seat Belts As Options on Current Models

Chrysler Corp. has announced the development of an automobile seat belt installation. It is said to meet functional specifications which the Civil Aeronautics Administration has established for seat belts in commercial airliners.

The seat belt package will soon be available as dealer-installed optional equipment for all 1955 Chrysler Corp. cars. No factory installations are planned for the present, although the possibility of adapting this package to Chrysler-built cars of previous model years is under investigation.

Tooling for the seat belt packages, which will be distributed by MoPar Parts Div., is now being completed. The belt installations will be sold either in sets of three for the front seat alone, or the car may be fully equipped with belts for six occupants.

More Four-Door Hardtops To Appear in 1956 Models

Four-door hardtop models apparently are going to sweep through the automobile industry next year. All of the Big Three manufacturers are expected to have four-door hardtops, even in their volume lines next year. The independent car makers also are said to be giving serious consideration to adding such models.

News of the AUTOMOTIVE

SILICONE TAP

The new 6000 kva electric smelting furnace at Dow Corning Corp. poured off its first tap of 98 per cent pure metallic silicon recently. After cooling from 3100 F to room temperature in 2½ hours, the ingot is broken from its sand bed, weighed, and sent to the crushers to be cleaned and ground down to a powder for use in manufacturing silicones.

AMC Orders 20,000 More Metropolitans

American Motors Corp has ordered another 20,000 Metropolitans from Austin Motor Car Co. of England. An earlier report from England quoted Austin as saying that the new order amounted to $20 million, but it did not divulge the number of units.

The new order is double the 10,000 commitment originally made by American Motors in December, 1953 and ultimately stepped up to 20,000. The Metropolitan last year was the largest selling foreign built car in this country, as approximately 7000 units were sold through Nash and Hudson dealers.

11 Firms Share U. S. Contracts Totaling More Than $35 Million

Government contracts totaling more than $35 million have been awarded to 11 companies. Glenn L. Martin Co. received the largest order, a $10 million contract for production of spare parts for B-57E light bombers. A $4.4 million contract to buy tools and equipment to produce J-57 jet engines was given to Ford Motor Co.

Other awards included: Sundstrand Machine Tool Co., $6.4 million for constant speed drives and spares; AC Spark Plug Div., General Motors Corp., $2.3 million for aircraft sights; Euclid Div., General Motors Corp., $2.5 million for aircraft towing tractors; Hughes Tool Co., $2.1 million for radio equipment; and Sperry Corp., $1.7 million for transmitters.

Chrysler Claims It Is Top User of Reinforced Plastic

The amount of plastics used by the automobile industry is illustrated in a report from Chrysler Corp. Chrysler, which claims to be the country's biggest industrial user of molded reinforced plastics, uses more than 26 tons a day of the material, chiefly for car heater housings.

Other applications by Chrysler include car air conditioning vents, station wagon trim moldings, and plastic dies for stamping out parts from steel. For heater covers Chrysler uses a compound of sisal and glass fibers, combined with polyester resin, an ingredient used at the rate of 5.2 million lb yearly.

Fringe Benefits to Employes Cost Ford $97 Million in '54

Probably at no other time in history have car manufacturers revealed more data on their labor costs than in the first few weeks following the start of contract negotiations with the union. On the heels of a full page newspaper advertisement published by GM in April listing accomplishments during the life of the expiring five-year contract, Ford, for the first time, revealed the amount it paid for fringe benefits to hourly rated employes last year.

According to the *Ford Rouge News*, a newspaper published for company employes, Ford last year paid $97 million for various fringe benefits, which were said to average 36 cents an hour per worker. The company estimated that it spent $1 on such benefits for every $6 earned by hourly employes. The report covered costs for unemployment compensation, retirement benefits, vacations and holidays, injury provisions, social security, hospitalization, insurance and others.

Carbon Monoxide in Air Found Harmless by GM

Carbon monoxide from automobiles presents no health problems to a city's population, according to a survey made by General Motors Corp. Confirming similar tests made in several large cities in the 1920's, GM found that the amount of carbon monoxide found in the atmosphere, even on "smog" days when the ratings are higher, was far below any level that hygienists consider harmful.

The survey was made by GM in mobile "test stations" which cruised through Los Angeles and Detroit streets during light, heavy, and dense traffic. Intake tubes of the instruments were arranged to register exposure a motorist would experience in a moving car and to simulate the breathing zone height of pedestrians at the curb.

In order to determine whether carbon monoxide polluted the air above cities, other tests were made at fixed locations 150 ft above street level. Less of the gas was found at the higher altitude.

AND AVIATION INDUSTRIES

MAMMOTH PRESS

Wing stiffeners, inner skins, and similar components for the Boeing B-52 Stratofortress are now being produced on this 7000-ton Bliss Hydro-Dynamic press. The behemoth was recently installed at Boeing's Wichita, Kans., plant. The press is said to make possible the heat treating of aluminum "super alloy" parts prior to forming them in the press. Two die slides, both power-operated, are located on opposite ends of the press. While one slide is in the press, a separate crew loads the other slide, fully utilizing press time.

Borg-Warner May Merge With Byron Jackson Co.

Directors are considering a plan to merge Borg-Warner Corp., Chicago, Ill., with Byron Jackson Co., Vernon, Calif. If the proposal is approved, stockholders of the latter concern would receive four shares of B-W stock for every five they hold in Byron Jackson.

The merger would enable Borg-Warner to further diversify its production in the oil field equipment industry. Byron Jackson makes centrifugal pumps, oil field tools, and other related products.

Trend Toward 14-in. Wheels On Vehicles Is Seen Soon

The trend to 14-in. wheels on passenger cars and light trucks now appears to be in the offing for 1957 models and might even come ahead of that year. An unconfirmed report states that a large producer in the Big Three field may offer 14-in. wheels on some 1956 models.

AI TABLOID

General Dynamics Corp. and Stromberg Carlson Co. are planning a merger. Stockholders of both concerns will vote on the proposal June 28.

* * *

New fuel system, designed around the Roosa-Master pump, is now standard equipment on all Harnischfeger Diesel engines. It was developed in cooperation between Harnischfeger and Hartford Machine Screw Co., builders of the pump.

* * *

Bell Aircraft Corp. has received an Air Force contract to build a new combat aircraft that is said to be in the bomber class.

* * *

Eaton Manufacturing Co. has bought Frederic Flader, Inc., engineering and research concern in North Tonawana, N. Y. . . . Aeroquip Corp. has acquired Marman Products, Inc., Los Angeles, Calif., maker of pipe clamps, joints, and valves.

* * *

International Harvester Co. has introduced a new multi-stop delivery truck of 16,000 lb GVW.

* * *

B. F. Goodrich Co. will market soon a line of tubeless off-the-road tires.

* * *

Caterpillar Tractor Co. has announced a new six-cylinder Diesel engine rated at 190 hp at 1200 rpm for intermittent service. Known as the Cat D342, it replaces the D13000 engine.

* * *

Rochester Products Div. of General Motors Corp. is now building a new 4GC carburetor for 1955 Buicks.

* * *

New Britain Machine Co. is offering a colored sound film entitled "A New Approach to Copy Turning."

Boyertown Auto Body Works has announced a new truck body with a light and small York refrigeration system for the dairy and other perishable food industries.

* * *

Elgin National Watch Co. has purchased Advance Electric and Relay Co. . . . Superior Engineering Corp. was bought by Breeze Corp.

* * *

Socony-Vacuum Oil Co. has announced development of an electronic instrument for analyzing automotive engine troubles.

* * *

Solar Aircraft Co. is building a new $100,000 research facility for testing gas turbine engines in San Diego, Calif. . . . Consolidated Engineering Corp. will construct a new $1.5 million research, engineering, and marketing building . . . Lockheed Aircraft Corp. plans a new $1 million engineering unit.

* * *

Stationary field electric clutch, manufactured by Warner Electric Brake & Clutch Co., has been mounted on some models of the De Havilland Otter plane. It is said to allow "power steering" of the tail wheel.

* * *

Four Wheel Drive Auto Co. has announced two new four-wheel drive transport tractors.

* * *

Norton Co. will open early next year a new plant at Santa Clara, Calif., for the manufacture of grinding wheels . . . Reynolds Metals Co. plans to build a $3 million aluminum extrusion plant near Richmond, Va.

* * *

American Iron and Steel Institute has announced the first major changes since 1952 in published designations for stainless steels.

(Turn to page 189, please)

News of the AUTOMOTIVE

CAR TOTAL FOR QUARTER WAY UP, BUT TRUCKS ARE DOWN

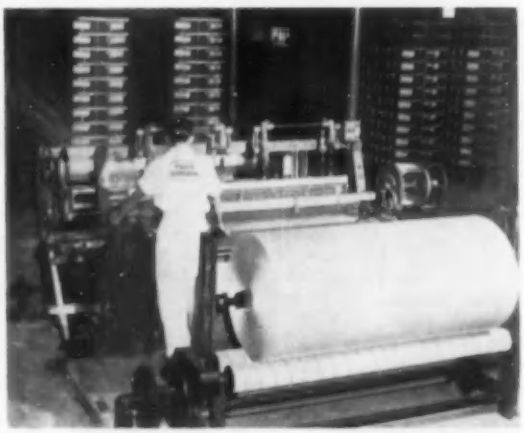
1955 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1955	Totals 1954
January	635,513	89,676	190	725,379	551,134
February	677,706	67,061	175	744,942	534,145
March	791,280	102,992	325	894,597	633,003
Total—Three Months	2,104,498	259,729	691	2,364,918	1,718,282

1955 U. S. Motor Truck Factory Sales by G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	42,396	15,056	4,090	16,510	4,741	3,279	3,636	89,676
February	30,036	11,277	2,645	11,949	3,575	3,380	3,899	67,061
March	48,816	18,275	4,155	19,213	4,363	3,407	4,663	102,992
Total—3 Mos. 1955	121,248	44,607	10,890	47,672	12,979	10,146	12,218	259,729
Total—3 Mos. 1954	130,521	52,543	10,534	52,837	11,931	15,537	10,582	284,485

* Automotive Manufacturers Association.



TIRE PLANT IN BRAZIL

Depicted here is a scene in the Fabrics Dept. of Pneus General, S.A., a Brazilian affiliate of General Tire & Rubber Co. Formed at the end of 1950 in conjunction with Brazilian industrial and banking groups, the company has a production plant near Rio de Janeiro at which production began about the middle of 1954. It has a current capacity of 173,000 car and truck tires.

BRITISH RACE CAR MAY RUN IN U. S.

This Scott sports racer, built by Connaught Engineering of England, is intended for export to the U. S. in modified form soon. Its supercharged four-cyl engine of 1484 cc displacement develops 112 bhp at 6000 rpm. Compression ratio is 8.5 to 1, and four Amal carburetors are used. Weight is 1230 lb, and top speed claimed is 130 mph.

Chambersburg Engineering Co. Is Building New Iron Foundry

Chambersburg Engineering Co. has begun construction of a large iron foundry to replace existing facilities which have been in operation since 1906. Production is expected to be shifted to the new building in October of this year without any interruption in schedules.

The monthly capacity of the new foundry will be 750 tons of castings to match output of the present foundry. Improved facilities in the new 48,000 sq ft building will permit the economical production of castings from 1000 lb to 60,000 lb each. Present cement bonded sand molding and core making methods will continue to be used.

Many of the operations of the new foundry will be mechanized. Practically all materials will be mechanically handled with electric trucks or conveyors. All melting will be done in cupolas with melt materials weighed and handled mechanically.

Willys to Establish Plant For Jeep Output in Turkey

Continuing to take advantage of the growing market for commercial vehicles abroad, Willys will set up a new plant in Istanbul, Turkey. To be known as Turk-Willys, the new plant will produce Jeeps for Turkey and other Middle East countries.

Although a majority of the capital for the new plant reportedly will come from Turkish interests, present plans call for the use of U. S. equipment. Earlier, Turkey had entered into an agreement with Federal Motor Truck Co., to set up a truck plant.

GM Closes Motorama With Record Crowds

A record two million persons visited the General Motors Motorama during its five-city tour this year. At Boston, where it played for the first time this year and where it ended its nationwide tour, the show attracted a record daily crowd of 84,895 on Sunday, April 24.

Total attendance in Boston also exceeded that of any other city where the show appeared.

AND AVIATION INDUSTRIES

AMC Spending $60 Million for Modernization Program

Although American Motors Corp. reached profitable operations in mid-February for the first time since it became a corporate firm last May, it suffered a net loss for the quarter ended March 31. Operating loss for the period totaled $1,588,390, despite sales of $133,744,922, but tax credits reduced the actual loss to $654,390, compared with a net loss of $5.4 million in the preceding quarter.

While not citing figures, AMC also reported a "substantial" net profit for March, reflecting the financial benefits that have been realized as a result of the merger of Nash and Hudson. Producing at near-capacity operations, the corporation now looks forward to its first quarterly profit in the period ending in June.

Cash Backs Optimism

Bolstering AMC's faith in the market for its products is the recent announcement that the corporation will spend $60 million during the next 18 months on a product development and modernization program. Most of the expenditures have been earmarked for expanding automotive facilities at the Kenosha assembly and engine plants and Milwaukee body plant.

A large portion of the amount for tooling is expected to go for the development of a V-8 engine for both Hudson and Nash. The 208-hp engine AMC now uses is produced by Studebaker-Packard. It is also likely that the present L-head six-cylinder engine will be converted into an overhead valve unit.

No new plants are included in the modernization program, which was announced last month on the eve of the corporation's first anniversary. The benefits that have accrued since the merger of Nash and Hudson were outlined by George Romney, AMC president, to press representatives during a tour of the Kenosha and Milwaukee plants.

Use of a common basic body shell for both the Nash and Hudson models, it was noted, saved the corporation at least $15 million in tooling costs, and distribution costs during the year were cut by more than $2 million by combining Nash and Hudson parts warehouses in 18 locations. Had each company retooled separately the total cost would have been about $25 million, compared with $9.5 million.

Lycoming Model C2-90 industrial engine.

Lycoming Div. Is Producing New Industrial Engine Line

A complete new line of aircooled, valve-in-head industrial engines, ranging from 20 to 75 hp, has been announced by Lycoming Div. of Avco Manufacturing Corp. The new family of engines includes two-cylinder vertical, opposed 4's and V-4's. The first of these, the C2-90 (see illustration), is already in production, and tooling on other models is now under way.

Model C2-90 is a two-cylinder engine that develops 30 bhp at 300 rpm. Base mounting dimensions, shaft dimensions, and mounting bracket dimensions are said to be interchangeable with other major air-cooled engine units. A second model, the CV4-180, which delivers 75 bhp at 3600 rpm, is expected to be available next few months, according to the company's announcement.

Continued on Page 112

APRIL OUTPUT BELOW MARCH BUT FOUR MONTHS UP

1955 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	April 1955	March 1955	April 1954	Four Months 1955	Four Months 1954
Hudson	6,999	10,345	1,803	26,378	8,166
Nash	14,515	15,956	5,911	44,634	26,406
Total—American Motors	21,514	26,303	7,714	71,012	34,573
Chrysler	17,700	23,520	9,840	75,613	41,000
De Soto	14,240	16,613	6,680	57,529	27,472
Dodge	30,472	35,208	13,603	129,889	44,087
Plymouth	76,443	79,680	39,423	288,237	139,896
Total—Chrysler Motors	138,915	154,221	69,524	551,448	252,165
Ford	153,940	157,672	128,190	592,548	497,610
Lincoln	4,548	4,479	3,313	15,642	16,250
Mercury	43,354	39,756	22,296	150,364	107,966
Total—Ford Motors	201,842	201,907	153,799	758,554	622,026
Buick	79,181	79,034	54,536	264,759	198,611
Cadillac	14,126	15,304	12,444	57,142	39,211
Chevrolet	163,179	173,031	140,588	644,220	499,357
Oldsmobile	56,828	50,093	43,940	216,094	138,748
Pontiac	55,604	59,894	35,091	213,100	134,101
Total—General Motors	370,918	385,936	288,799	1,416,315	995,110
Packard	7,067	8,441	3,377	27,531	14,965
Studebaker	11,725	16,147	6,564	54,580	31,713
Total—S-P Corp.	19,982	24,588	9,926	82,111	46,678
Kaiser			1,163		3,898
Willys	1,314	1,644	2,239	5,694	5,498
Total—Willys Motors	1,314	1,644	3,402	5,694	9,496
Total—All Makes	754,086	794,599	533,164	2,884,134	1,958,078

Men in the News

Ford Motor Co.—Richard E. Krafve has been named general manager of the new Special Products Div., and Charles F. Moore, Jr., has been elected vice-president in charge of public relations for the company.

American Motors Corp.—**Roy D. Chapin, Jr.,** has been elected treasurer.

Willys Motors, Inc.—**Cruse W. Moss** has been appointed assistant general sales manager.

Canadian Allis-Chalmers, Ltd.—**Harold M. Schudt** has been elected president.

Detroit Steel Corp.—**Howard V. Clark** was promoted to executive vice-president; **V. R. Bates,** sales vice-president; and **A. D. Brown,** vice-president in charge of plant operations.

National Automotive Fibres, Inc.—**John G. Bannister** has been elected president.

National Tool Co.—**Howard C. Liebing** has been appointed sales manager.

Budd Co.—**Percy R. Keller** and **Thomas R. Wagner** have been elected vice-presidents.

Lincoln Engineering Co.—**Carl H. Mueller** was named vice-president in charge of engineering, and **John E. Renner** was made vice-president in charge of sales.

E. F. Houghton & Co.—**John Bermingham** has been appointed Western sales manager.

Minnesota Mining & Mfg. Co., Adhesives and Coatings Div.—**Alvin O. Fuhrmann** was named national aircraft sales manager.

Ethyl Corp. of Canada, Ltd.—**Alan C. Tully** has been elected president.

Ford Motor Co., Tractor & Implement Div.—**William H. Sivy** was made manager of the Manufacturing Engineering Dept., and **Jerome F. Fitzsimmons** was chosen manager of the Consumer Research Dept.

Mack Trucks, Inc.—W. M. May has been appointed chief engineer.

R. C. Mahon Co.—**R. C. Mahon** was elected chairman of the board; **Walter F. Sheets,** president; **Harry J. Lawther, Jr.,** secretary-treasurer; **C. L. Chubbuck,** first vice-president; and **R. J. Kraemer,** second vice-president. **Frank J. Bomerscheim, Leston F. Chatfield, W. Henry Duggy, David J. Duggan,** and **Wallace Herdlein** were named vice-presidents.

Northrop Aircraft Corp.—**Ray Gayner** has been named assistant to the manufacturing vice-president.

Pangborn Corp. — Arthur J. Buckley has been promoted to sales manager.

Handy & Harman—**M. W. Townsend** has been made a director.

Cummins Engine Co., Inc.—**E. D. Tull** has been appointed executive vice-president; **R. B. Stoner,** vice-president for personnel; **C. R. Boll,** vice-president of sales; and **P. J. Every,** general sales manager.

Libbey-Owens-Ford Glass Co.—**William H. Hasselbach** has been elected vice-president charge of engineering; **Harry B. Ryan,** comptroller; and **Richard M. Weter,** treasurer.

Clark Equipment Co., Transmission Div. —Roger W. Robinson has been appointed sales manager.

Ford Motor Co.—Ben D. Mills and F. C. Reith have been appointed vice-presidents, and the former is now general manager of the Lincoln Div., while the latter holds a similar position with Mercury Div.

Convair Div., General Dynamics Corp.—**Charles L. Critchfield** has been appointed director of scientific research.

Standard Tube Co.—**Thomas F. Thornton** has retired as executive vice-president; **Ralph E. Hoover** is now assistant to the president; **Lawrence B. Boensch,** district sales manager; and **Harry E. Colwell,** chief inspector and process engineer.

Dodge Div., Chrysler Corp.—**James E. Murphy** is now Eastern Zone manager.

Arwood Precision Casting Corp.—**William O. Sweeny** has been elected vice-president in charge of sales.

Kinney Mfg. Div., New York Air Brake Co.—**William B. Mills** has been appointed assistant sales manager.

Lake Erie Engineering Corp.—**E. M. Detwiler** is now works manager; **William H. Bennett,** sales manager; **Robert J. Fuller,** assistant treasurer; and **Robert W. Gerhardt,** sales project engineer for die casting machines.

General Motors Corp.—**Anthony De Lorenzo** has been made director of press and radio relations, succeeding **Kenneth Youel,** now director of divisional relations in the Dept. of Public Relations. **Thomas E. Groehn** was named executive in charge of press and radio relations in Detroit.

Pangborn Corp.—**David Bair** is now manager of the Detroit district.

Chrysler Corp.—**Robert M. Franklin** has been named communications coordinator, and **H. A. Davis** has retired as treasurer.

Lockheed Aircraft Corp., Georgia Div.—**Lewis H. Height** has been named chief project engineer.

Eclipse-Pioneer Div., Bendix Aviation Corp.—Roy H. Isaacs has been appointed general manager.

Westinghouse Electric Corp.—**L. W. Golden** has been named manager of the new Director Systems Dept.

Bendix Aviation Corp.—**Arthur E. Raabe** was appointed to the corporation staff to coordinate commercial aviation sales for 12 divisions. **Milo F. McCammon** and **Charles A. Wolf** have been named assistant general manager and director of sales and service, respectively, of the Teterboro Div.

White Motor Co., Diesel Engine Div.—**William F. Burrows** has been appointed general manager.

Dayton Rubber Co.—**Gordon E. Williams** has been named truck tire sales manager.

Eaton Mfg. Co.—**H. C. Stuessy** has retired as secretary.

Soreng Products Corp.—**Gilbert R. Calkins** has been appointed vice-president, director of sales.

Chrysler Div., Chrysler Corp.—**Maurice J. Harris** has been promoted to assistant sales manager in charge of field operations, and **Elmo L. Joseph** succeeds him as Eastern Div. sales manager. **Charles E. Sumrall** has been advanced to Central Div. sales manager.

Climax Molybdenum Co., Sales Div.—**Lars E. Ekholm** has been appointed manager.

Firestone Tire & Rubber Co.—**James W. Maples** was promoted to director of manufacturing for all rubber manufacturing plants in the U. S. and Canada.

Aetna Ball & Roller Bearing Co.—**Richard F. Harrington** has been appointed chief development engineer.

Le Roi Div., Westinghouse Air Brake Co.—**K. Leslie Morgan** has resigned as director of purchases and traffic.

American Motors Corp., Kenosha Engineering Div.—**E. L. Monson** has been appointed assistant chief engineer in charge of development and test procedure; **J. S. Voigt**, assistant chief engineer in charge of design and technical activities; and **K. M. Silcock**, special assignment engineer.

Gisholt Machine Co.—George M. Class and Frederick L. Chapman have been elected vice-presidents.

Chrysler Corp., Marine & Industrial Engine Div.—**A. Gordon Cunnings** has been placed in charge of a new regional office in New York City.

Ampco Metal, Inc.—**James A. Arter** has been named vice-president in charge of manufacturing; **J. P. Henry**, general sales manager; and **R. J. Severson**, assistant general sales manager.

Piasecki Helicopter Corp.—**Virgil J. Wiltse** was named director of personnel.

Brown Instruments Div., Minneapolis-Honeywell Regulator Co.—**John E. Boyle** has been appointed director of business planning.

Globe Hoist Co.—**Isabelle Smullen** was named advertising manager.

Allis-Chalmers Mfg. Co.—Robert S. Stevenson has been elected president.

B-O-P Assembly Div., General Motors Corp.—**Kenneth N. Scott** was named manager of the Southern California plant; **Robert J. Hammond**, manager of the Arlington, Tex., plant; **Joseph C. Christy**, production manager of the Southern California plant; and **H. F. Settle**, production manager of the Arlington plant.

Voi-Shan Mfg. Co.—**Max DeZemplen** is now general sales manager.

Olin Mathieson Chemical Corp., Electrical Div.—**Richard W. Snyder** has been appointed sales manager.

W. C. Twigg Industries, Inc.—**W. L. Wilkinson** has been appointed sales manager.

Metal Cutting Tools, Inc.—**Bruce G. Miller** has been named vice-president and general manager, and **Ray E. Ambrose** is now sales manager.

Climax Molybdenum Co., Metallurgical Development Div.—Norman L. Double has been named manager.

Lincoln Electric Co.—**Norman J. Hoenie** has been appointed chief engineer of the Machine Div., while **Emmett Smith** has been named chief engineer for the Electrode Div.

Ohio Seamless Tube Div., Copperweld Steel Co.—**J. E. Horner** is now manager of sales; **J. J. Arntz**, assistant sales manager; and **M. W. Freese**, promotion and market development manager.

Midland Steel Products Co.—**W. E. Hornig** has been elected treasurer.

(*Turn to page 210, please*)

Necrology

Walter C. Baker, 87, pioneer automobile manufacturer of the Baker Electric, died April 26, at Cleveland, O.

A. G. Phelps, 64, executive assistant to the general manager of Delco-Remy Div., General Motors Corp., died May 1, at Anderson, Ind.

George G. Hughes, 56, personnel director in the New York offices of General Motors Corp., died April 25, at New York, N. Y.

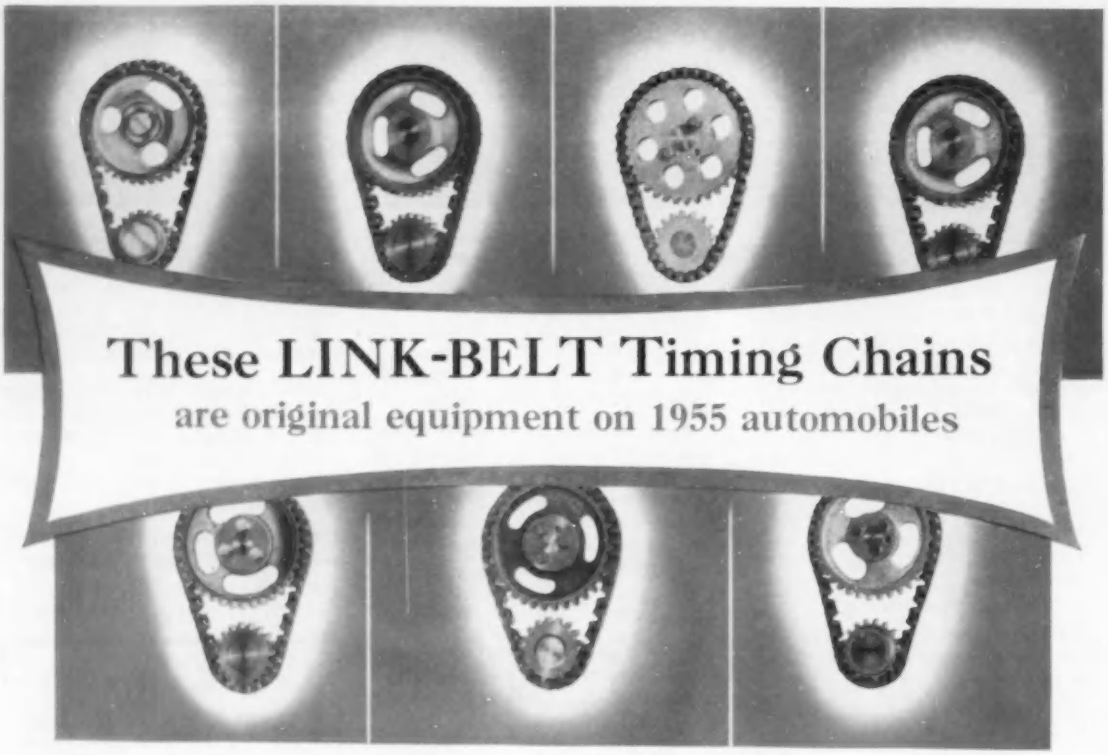
Henry Thorkildsen, 63, director of purchases for Wisconsin Motor Corp., died April 17, at Milwaukee, Wis.

C. B. Waterman, 76, often called the inventor of the outboard motor, died April 19, at Detroit, Mich.

John F. Wandersee, 76, early associated with Ford Motor Co. and retired materials engineer, died April 19, at Detroit, Mich.

Gordon W. Cameron, 60, vice-president and treasurer of Aluminum Co. of America, died April 29, at Pittsburgh, Pa.

Michael Nazaruk, 33, well-known Indianapolis Race driver, was killed in a race accident May 1, at Langhorne, Pa.



These LINK-BELT Timing Chains

are original equipment on 1955 automobiles

And here's why:

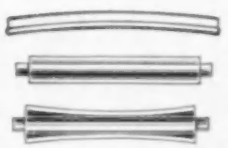
Link-Belt Timing Chain gives you

1 AUTOMATIC JOINT SNUGNESS 2 SMOOTHER OPERATION 3 LONGER LIFE

THE most important difference in today's timing chain designs is illustrated at right. Note how segmental bushings automatically compensate for wear . . . provide for complete joint snugness at all times. In action, Link-Belt gives you anti-whip, anti-back-bend chain—and more miles of quiet operation.

This advanced design is a product of the continuous research and advanced testing facilities in the world's largest chain plant. Let our engineers provide a test drive to your specifications. Or, for full information, get Book 2065.

Segmental bushings provide automatic joint snugness



Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

Bow in bushings acts to keep a snug joint on non-load side, maintaining chain pitch automatically.

LINK-BELT

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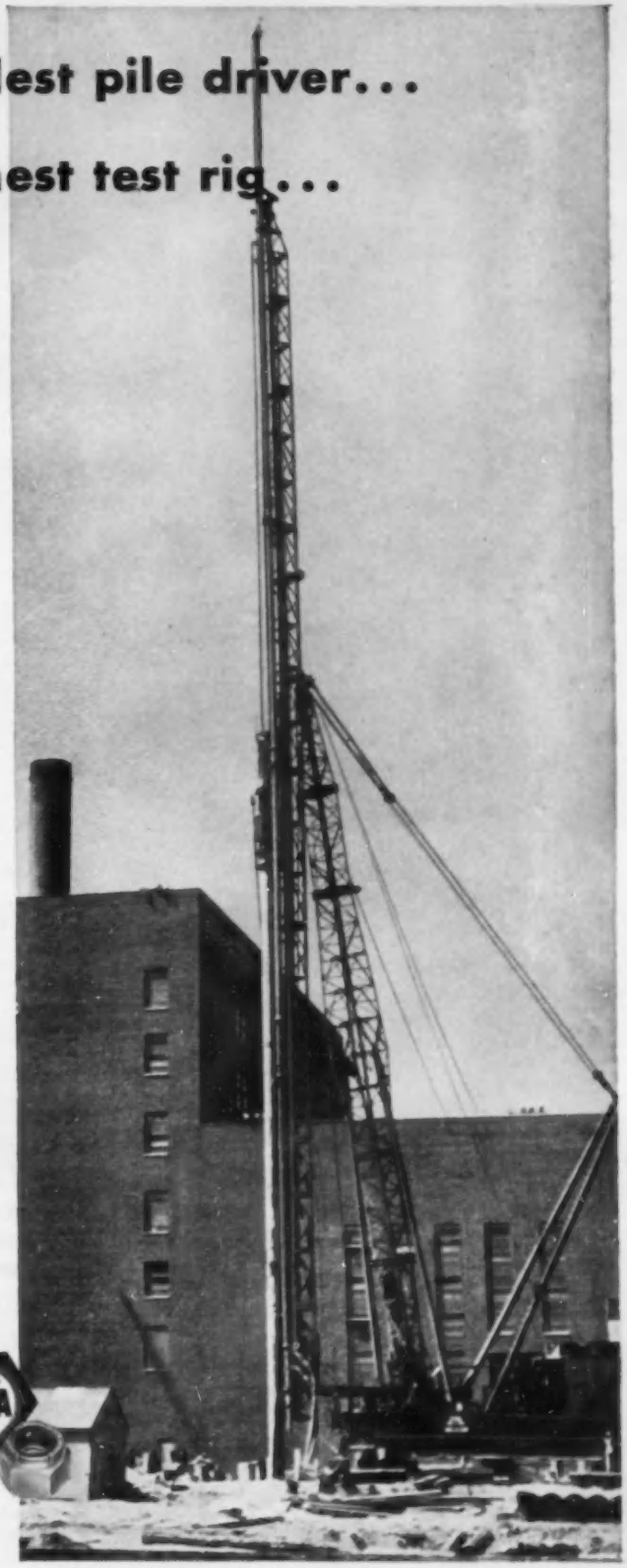

Each hammer-stroke of this 270-foot pile driver delivers a 24-foot-ton wallop! It was built by Raymond Concrete Pile Company to drive 200-foot pipe piles for the foundation of units being added to the B. C. Cobb Steam Plant of Consumers Power Company, at Muskegon, Mich.

Raymond makes a practice of using Elastic Stop® nuts for bolting together sections of leads and booms on all their pile-driving equipment. The red elastic locking collar of these vibration-proof fasteners has successfully maintained its grip under these severest of all vibration and impact conditions!

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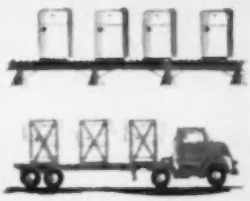

The purpose of lock washers is to keep screws and nuts tight.

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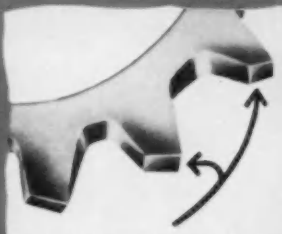
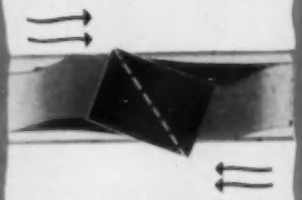
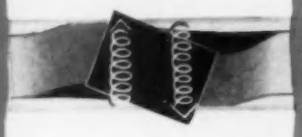


Only Shakeproof LockWashers have these exclusive tapered-twisted teeth . . .

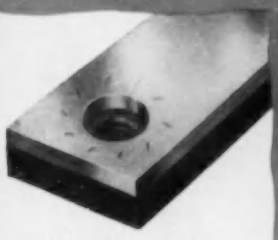


where each tooth is a strut to resist all loosening rotation of threaded fastening.



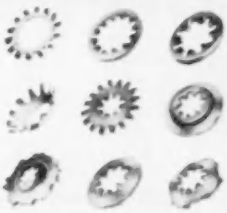
Spring tension forces the edges of each tooth to bite deeper.

Shakeproof Lock Washers lock tighter as vibration increases . . .



and the locking power of each tooth is multiplied by the number of teeth.

Their exclusive mechanical lock resists loosening as no other lock washer can!



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WORLD'S BROADEST LINE OF MASS-ASSEMBLY FASTENINGS

Many Special Cars at Turin Show

Peugeot 403 sedan

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

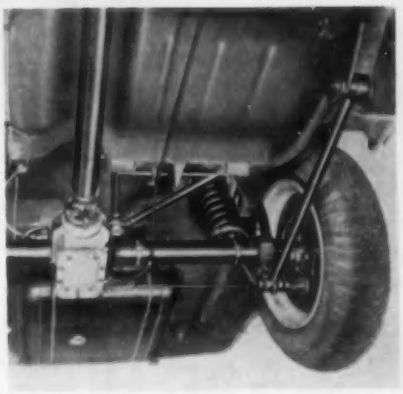
TURIN, ITALY

ITALY'S international automobile show, held at Turin last month, revealed the growth of the industry by an increase of floor space to 302,000 sq ft and 450 exhibitors representing 13 nations. There were 67 makers of passenger cars, the United States leading, followed by England. Of the nine makes of commercial vehicles, all were Italian with one exception. Italy's automobile position is shown by 1,070,000 registrations of all types at the end of last year, and a production of 216,700 vehicles, of which 44,136 were exported.

Immediate left—Custom body by Boano on Fiat 600 chassis. Above left—Pinin Farina's special treatment of Fiat 600

Left—Alfa-Romeo Giulietta four-door sedan. Below—rear axle arrangement on Alfa-Romeo Giulietta.

Ferrari 12-cyl. two-passenger coupe



Fiat's decision to uncover the rear-engine four-passenger 600 model at the Geneva show (A.I. April 15) robbed Turin of what would have been its greatest novelty. This model replaces the smaller two-passenger 500 which has been in constant production since 1936 and has been one of the most successful of European light cars. Fiat now has completely modernized its plant, with four main lines of passenger cars—600, 1100, 1400, and 1900. Production of the four types, with their variants, including trucks, now is 800 per day and is expected to reach 1000 by the middle of the year. The numerical importance of these models is not known, but the 600 and the 1100 are well ahead of the others.

The only entirely new Italian model was the Alfa Romeo Giulietta, a four door, four passenger model with a twin camshaft overhead valve engine of 2.91 by 2.95 in. bore and stroke (78.6 cu in.), developing 50 hp at 5200 rpm. Wheelbase is 94 in. and front tread 50 in. Weight of the sedan 2114 lb.

The production program calls for 1000 per month almost immediately, the price on the Italian market being equivalent to $2,054. This will be the cheapest car produced by Alfa Romeo and on the home market it will come into competition with the Fiat 1400 and to some extent with the four-cylinder Lancia Appia.

The car has a four-speed transmission (all synchronized), a two-section propeller shaft, a hypoid final drive with a ratio of 9-41, and variable rate coil spring suspension front and rear.

A variant of the Fiat 1100 was the two-passenger convertible runabout with engine speed upped by 200 rpm and with lower weight than the standard 1100.

The French Peugeot Co. made simultaneous presentation in Turin and Paris of the new 403 sedan. Since getting into postwar production, Peugeot had built one model only, the 203 with a four cylinder engine of 78.6 cu in. In deciding on a larger car with six-passenger capacity, no change was made in general design.

The four cylinder engine with wet liners has a bore and stroke of 3.14 by 2.87 in. with 89 cu in. piston displacement. Pushrod operated valves and a hemispherical combustion chamber are other features of the engine which develops 58 hp. The four-speed transmission has overdrive on fourth. A worm type rear axle is used. Front independent suspension is by transverse spring, and coil springs are used at the rear, all these features being common to the 403 and the 203. On both models the seats are designed to fold down into sleeping berths.

The absorption of the French Ford by Simca was revealed by the appearance on the Simca stand of the

(*Turn to page 204, please*)

By W. Wai Chao
Section Supervisor
Combustor and
Heat Exchanger Section
Scientific Laboratory
Ford Motor Co.

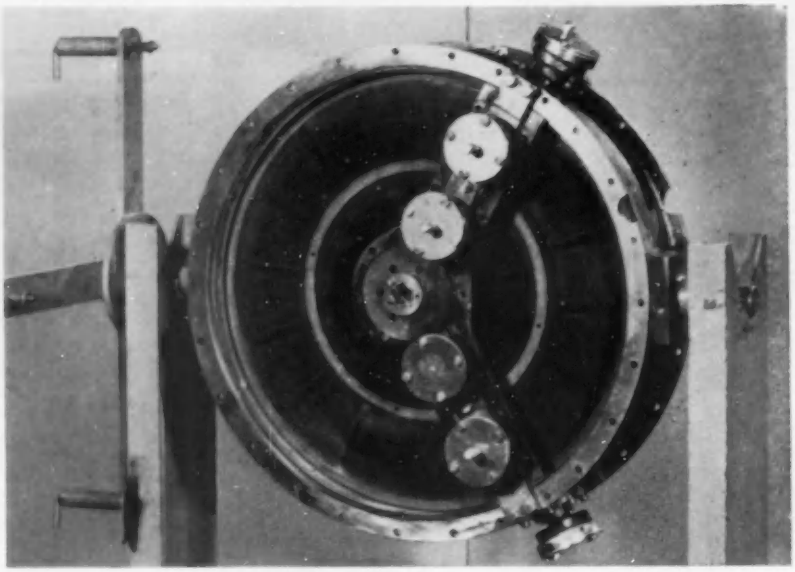


Fig. 1 Completely assembled regenerator

ENGINEERING DETAILS of Ford Rotary Heat Exchanger for Gas Turbine Engines

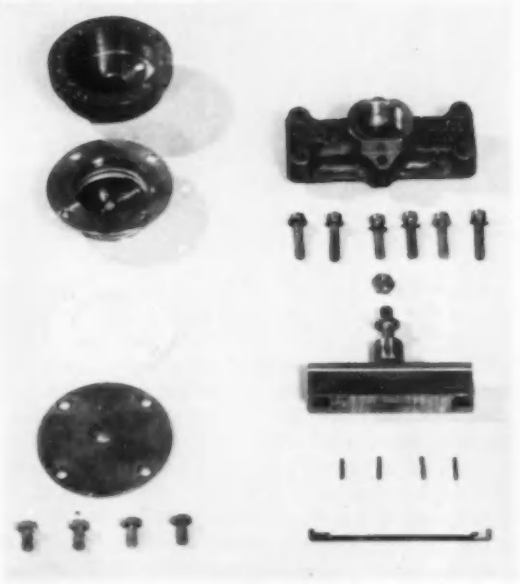


Fig. 3. Exploded view of the regenerator sealing mechanism

It is a well known fact that a simple cycle gas turbine power plant, which consists only of a single-stage compressor, combustion chamber, and turbine, cannot compete with the current reciprocating engines in fuel economy. One of the means to improve the specific fuel consumption is to introduce a heat exchanger to recover some heat energy from the exhaust gas and to preheat the combustion air.

From the standpoint of automotive application, the heat exchanger must be extremely compact as well as capable of meeting the requirements of high effectiveness and low pressure losses. This article deals with a prototype rotary regenerator of "unbalanced" design which has been engineered and tested at the Scientific Laboratory of Ford Motor Co. as a part of the automotive gas turbine program.[1]

The principle of effecting the desired heat exchange by means of using a porous heat-storage medium exposed alternately to hot and cold fluids dates back to Sterling in 1816 and has been used for

Fig. 2. Regenerator sub-assembly groups

Fig. 4. Enlarged view of rotor matrix corrugations

many years in blast furnace and boiler practice. The term regenerator is now generally used to denote this type of heat exchanger, and the term recuperator for the more conventional type, in which heat is transferred directly from the hot to the cold fluid through an intervening wall.

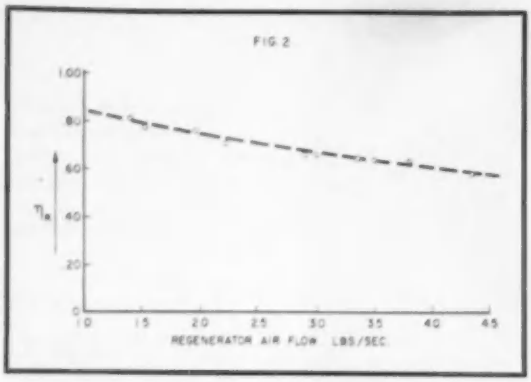
The regenerative material in a regenerator is often referred to as a matrix, for which many ingenious designs have been proposed. The Fränkl matrix, fabricated from continuous sheet metal corrugations, for example, is well known. The idea of using a rotor carrying the matrix dates back to 1920's, to Ljungström and his air preheater designs.[2] A proposal to apply this type of heat exchanger to gas turbines was made by Ritz in Germany during the war,[3] in which he emphasized the basic design advantages of having laminar gas flow in the small matrix passages. He also examined both the disk-type rotating matrix with axial flow arrangement and the drum-type rotating matrix with radial flow arrangement.

In recent years, several independent groups of British scientists and engineers have been carrying on where the Germans left off. C. A. Parsons engineers, some of whom were former colleagues of Ritz, have concentrated their effort on the development of drum-type matrix, presumably with the large power plant installations in mind.[4, 5] But positive information on the Parsons work is lacking. The National Gas Turbine Establishment, on the other hand, expended six years on the development of disk-type matrix of "balanced" design.[6, 7]

In general, however, in contrast to recuperator-type heat exchangers, available information on regenerator development is very meager, and as far as can be determined, there has been no literature available regarding the actual design and operation of a regenerator in conjunction with a gas turbine installation.

The external shape and dimensions of the experimental regenerator assembly at Ford's Scientific Laboratory were largely determined by the arrangement of the gas turbine power plant. The selection of the disk-type configuration, however, as versus the drum-type, also had other considerations. In general, the mechanical design and fabrication of the disk-type is simpler than the drum-type. On the other hand, whereas the flow area is limited by the diameter for the disk-type, it can be increased with ease for the drum-type design. Thus, if the entire mass flow is sufficiently small to be accommodated by a single rotor, as is the case here, it is generally advantageous to use the disk-type design.

Figure 1 shows the regenerator completely assembled on the stand which is also used to support the regenerator for component tests. An exploded view of the regenerator sub-assembly groups is shown in



Regenerator effectiveness

Fig. 2. The unbalanced regenerator configuration, with a gas to air side area ratio around 2:1, was designed to meet the general requirements of over 80 per cent regenerator efficiency at the idling engine operation and less than one psi gas side pressure drop at maximum power with an average rotor speed of 20 rpm. The rotor is driven by a pinion installed on the regenerator housing and through the rim gear on the rotor. The rotor disk, 22 in. in diameter, was formed by winding corrugated and plain stainless steel strips on a 4 in. diameter center hub. The material used is 0.002 in. thick, type 430 stainless, 3 in. wide. The rotor is held together by radial spokes tightened between the hub and the inner and outer rings which were shrunk on the matrix. Pressure-balanced type sealing mechanism is used to prevent the compressed air from leaking to the gas side over the face and rim of the rotor. An exploded view of the sealing mechanism is shown in Fig. 3. Piston rings are used to seal off air passages around the hub. The rotor is supported by two Graphitar bearings which are shrunk inside the hub and ride over the shaft. The latter has right and left hand threads for the radial seal-shoe housings and can be used to adjust rotor thrust bearing clearance during assembly. The entire rotor weight and pressure load is carried through the radial seal-shoe housings and supported by the regenerator housing. An enlarged view of the rotor matrix corrugations is shown in Fig. 4. The average hydraulic diameter of the matrix passages is 0.026 in. and gives a heat transfer surface density of 1600 ft^2/ft^3. The complete rotor uses approximately 35 lb of sheet metal, 1750 ft in length, and provides around a quarter million through-flow passages.

For regenerator tests at the Scientific Laboratory, the combustion chamber is used as a hot gas generator, and the entire gas flow is throttled to the desired pressure level and ducted through the regenerator gas side. For combustion chamber tests, the regenerator air outlet temperature is controlled by ducting only part of the hot gas mixed with additional cold air through the regenerator gas side. The regenerator is driven through a flexible shaft by an electric motor with a variable speed transmission. The entire drive unit is mounted on bearings so that the drive torque can be measured directly through a scale.

The test stand is extensively instrumented for temperature and pressure measurements. Static measurements for pressure are recorded by manometer photographs, and for temperature, Brown recorders are used. For transient measurements, Sanborn recorders are used in connection with fast-response thermocouples and pressure pick-ups. The air flows are measured by two calibrated orifice plates, one upstream and the other downstream of the regenerator on the air side. For safety reasons, all test operations and data recordings are performed at the control panel which is separated from the test cell by a heavy wall.

The above is an abstract of a paper presented by the author at the 17th Annual Meeting of the American Power Conference in Chicago.

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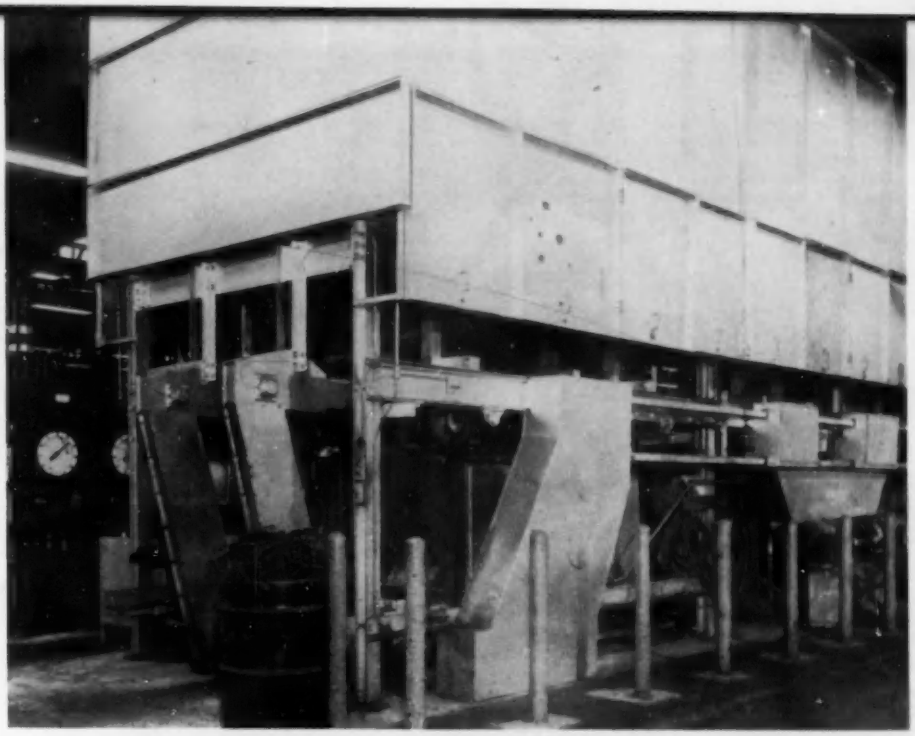
Tremendous Growth Reviewed At 3M Research Dedication

New products and processes developed through research highlighted the dedication of Minnesota Mining & Manufacturing Co.'s new Research Center on May 12. The dedication program was held in the Central Research Laboratory building, first unit to be completed at the Center. An electrical products laboratory building also is nearing completion.

Featured at the dedication was a cross country transmission of color television on magnetic video recording tape. This 3M tape, developed by the Central Research group, records the audio and video portions of the tv signal and reproduces the sound and pictures immediately on playback.

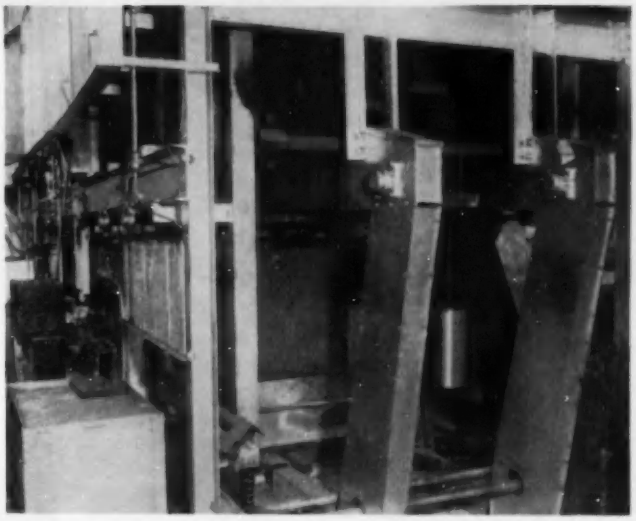
The company had only one product, sandpaper, during the first quarter century. Since that time it has added magnetic tape, "Scotch" Brand cellophane tape, along with more than 200 varieties of pressure-sensitive tapes, roofing granules, reflective sheeting for safety and advertising uses, a full line of electrical insulating products, a line of adhesives and coatings, a new series of fluorochemicals with unusual physical and chemical properties, a number of graphic arts products, office duplicating equipment, and others. Sales last year totaled $230 million.



There are four Ajax induction salt bath furnaces in this machine, used for heat-treating cylinder liners. Temperature in each is controlled automatically from panels at left. Timers control conveyors and thereby the time in each bath.

SPECIAL SETUP Reduces Cylinder Liner Distortion

By Herbert Chase



Each cylinder liner is held vertically on an individual rack and transfer is completely conveyorized through this installation of salt bath furnaces

SEVERAL improvements in processing cast Mehanite liners for Diesel engines built in the Melrose Park Works of International Harvester Co. have not only improved quality but have lowered overall costs. This has come about largely by expedients to reduce distortion that, previously, gave considerable trouble.

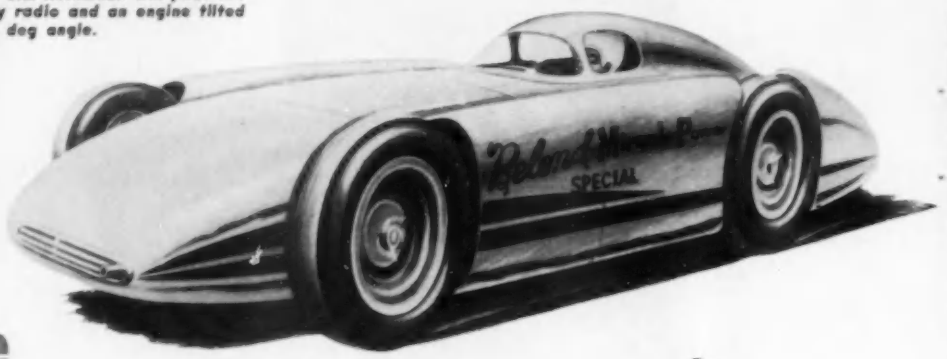
A part of the deformation arose because the liners are thin wall castings and, when clamped in conventional chucks while being bored, were distorted. When unclamped, release of clamping pressure, applied when the bore was machined to a true cylinder, caused liners to go out of round.

This clamping distortion has now been eliminated by using a new form of chuck in which the clamping is done by an air hose wound in a helix and interposed between the OD of the liner and the pot chuck. This hose applies uniform and balanced clamping pressure throughout the complete OD, hence, when the clamping is released, the bore is not distorted.

Subsequently, the OD is machined partly to provide uniform wall thickness, after which the liners go to heat-treatment. Formerly, the rough machined liners were loaded on trays and passed through a gas fired

(*Turn to page* 126, *please*)

Sketch of the Beland-Miracle Power Special—aerodynamic streamliner entered by the makers of Beland Exhaust System Products. Jim Rathmann will pilot the car, which has a two-way radio and an engine tilted at a 36 deg angle.



Pre-Race Engineering Activities for Indianapolis Speed Classic

By R. Raymond Kay

WHAT will the new streamliners do? Will power steering pay off? How will the rookie drivers do against the veterans? Will the Ferrari make it? Is this Novi's year? Will improved wheels, brakes, and tires add to the speed? Will new speed records be made? Will Billy Vukovich make it three straight?

Racing enthusiasts will get the answers at the 39th Annual Memorial Day 500-mile speed classic at the Indianapolis Motor Speedway, and there will be many interesting things to look for: car-to-pit radios, a new Firestone tire, a new model magnesium wheel.

Everything is in high gear for the fastest race in Speedway history. It will take a 139 mph average qualifying speed to get one of the 33 starting positions. About 55 to 60 cars will battle it out. The post position winner will probably average 143 mph.

Will the 500-mile grind produce a new speed record this year? Speeds often depend on the psychological state of drivers during the race. If one gets hurt, they all automatically slow down. Barring accidents, and with favorable weather and track conditions, speed for the race could well average 133 mph, up from last year's record 130.84 mph.

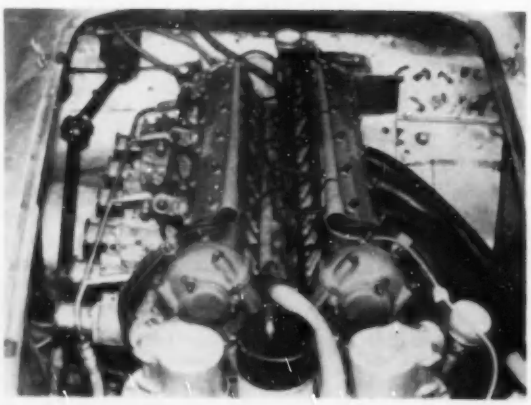
Many modern-day passenger car improvements originated with Indianapolis competition. The 1955 event may have a reverse twist—race-car designers using a passenger-car development. Look for some cars with power steering.

Once again the old reliable Meyer & Drake 4-cyl 270-cu-in. Offenhauser engine will power most of the entrants, with 10 new engines this year, according to vice-president Louis Meyer. And about 75 per cent of the cars are Kurtis-Kraft built.

The Offenhauser engine, basically unchanged for 20 years, has been gone over with a fine tooth comb season after season to improve its performance and reliability. This year, Leo Goossen, Meyer & Drake's executive engineer, says the scavenging oil pump capacity is 15 per cent greater. And now there's a power-takeoff to drive a hydraulic pump for those cars with power steering.

The offset engine technique has certainly proved itself. About 20 entrants are using it this year. Drivers consistently report better handling of their cars on the turns and increased speed.

A 2.5- or 3-litre engine for Indianapolis would surely spark racing fans. It would give the Classic an



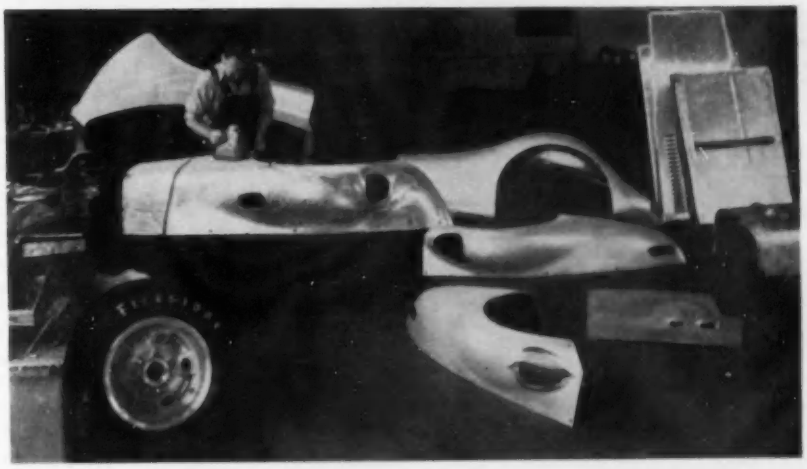
Test installations of the new six-cylinder Ferrari engine which will be installed in a Bardahl-Ferrari Experimental car for the 500 mile race.

international flavor and make it possible for owners to run their cars on dirt tracks as well.

If Speedway officials changed the displacement rule to comply with the foreign formula, it would put U. S. racing on an equal footing with foreign racing. Also, U. S. race car designers would have a better chance to try out many new ideas. If such a rule change came along, it should be postdated three years anyhow to give owners of today's equipment a chance to get more use out of it. Fans would certainly like to see foreign cars and drivers pitted against our boys and equipment.

It would be mighty interesting to see foreign engines in U. S.-built cars, and Indianapolis fans this year may have a preview. Bardahl Mfg. Co. is entering a Kurtis-Kraft 500-D powered with a special-design 6-cyl Ferrari engine. The Ferrari is lighter than the Offenhauser and is reported to develop over 400 hp.

Radically new streamlining featured in Kurtis-Kraft-built Sumar Special. Plexiglas canopy, for qualifying runs only, will give way to standard-type windshield for the race. Top and side air scoops provide under-the-hood and cockpit ventilation. Car built for Chapman Root, Terre Haute, Ind.



Body panels of Sumar Special are aluminum alloy. It is claimed that two men can completely disassemble body panels in five to eight minutes.

Several modified stock engines are in the works. Hustling to be finished in time for the race is a 16-valve-head Studebaker engine for the Lindsay Hopkins car. Its designer is Willie Utzman who made a similar modification for J. C. Agajanian several year ago.

Dean Van Lines plans a 1955 Dodge V-8 engine for one of its two entries. In fact, there are actually three of the Dodge engines readied: one for practice in the new car, one for the qualifying runs, and one for the race itself. All three are 269 cu in. Tony Capanna, who made the modifications, reworked the water flow pattern to distribute water more evenly around the block and head and added Hilborn fuel injection equipment.

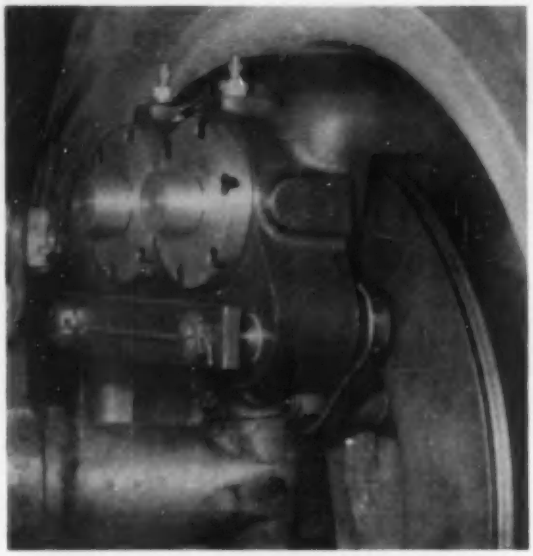
Connecting rods, bearings and crankshaft are all said to be stock parts. The car has Offenhauser flywheel, clutch, and transmission.

Mr. Capanna says the engine used for practice has done 184 mph in a coupe at Bonneville. The qualifying engine is designed to use a greater amount of fuel (probably nitro-methane) than the engine for the race itself.

The engine weighs about 30 lb to 40 lb more than the average Offenhauser installation. It's expected to operate at 5500-7500 rpm, developing 310 hp at 7000 rpm.

Frank Kurtis has something radically new for this year's race—a streamliner that could start a new trend in race body designing. Kurtis-Kraft, Inc., Los Angeles, built a car that looks like a miniature of the huge cars which have set world records over the measured-mile course on the Utah Salt Flats in recent years. And it has a faired wheel design, believed the first ever prepared for Indianapolis.

Here are some features of the car, the Sumar Special, built for Chapman Root, Terre Haute, Indiana, which Jimmy Daywalt will drive. It's 3 in. lower in the frontal area than the familiar Kurtis models and weighs 1946 lb dry. Wheelbase is 96.5 in. All four tires are faired in. There's a tail fin that extends



Halibrand Engineering Co. dual-spot aircraft-type brake. Illustration shows this year's modification.

Halibrand Engineering Company's new 16-in. cast magnesium wheel. Rim, wall section, and pressure plate are cast in one unit. Wheel weighs 13½ lb, probably lightest magnesium wheel of this size developed for Indianapolis use.

to 39 in. above the ground. A Plexiglas cockpit canopy will be used only in qualifying. Sides of the body are left open at the wheels for quick wheel changes. Openings and air scoops in front and side panels give better air distribution for cooling brakes and tires. The exhaust manifold is recessed in the top of the main body cowling and extends alongside the cockpit to the rear fin.

Chassis is basically the Kurtis 500-D, incorporating the conventional welded steel tubing frame. It has a superstructure for attachment of firewalls, insulation, and body panels. The firewalls were louvred to improve engine ventilation. An air scoop on top of the body leads to the cockpit for cooling. Scoops on each side are for tire cooling.

Because of the faired wheel design each rear fender fairing has a "window" installation so that the driver can check on tire condition. A small removable panel in line with the driver's vision permits front tire checking.

Power plant in the car is a 4-cyl, 270 cu in. Offenhauser engine. Injection-type fuel supply is supplemented by mild pressuring ahead of the fuel injectors through the use of an air scoop in the hood.

Another streamliner built for this year's race is the Belond-Miracle Power Special. Its body shell is as wide as the wheels to guide air streams around the wheels and reduce drag to a minimum. Quinn Epperly designed the body and Jim Rathmann will drive the car.

The chassis is a Kurtis unit, redesigned to accommodate the streamlined body. Frame work is steel channel and tubing in sizes from ¾-in. to 1½-in. The car's dimensions are 15 ft long, 5 ft wide, and 44 in. high. Its lowest point is 4 in. above ground.

The body shell is 14-ga sheet aluminum. Dzus fasteners attach the eleven separate panels to the chassis frame work. The builders used reverse order in putting the car together. They mounted the engine, transmission, rear end, fuel and oil tanks on the frame before they attached the body so that the mechanics could quickly remove the shell for running gear inspection.

Dry weight is about 1935 lb. The tail portion behind the driver will mount a 61-gal steel gas tank. A Fiberglas material will coat the outside to increase its strength.

The car's equipment includes a 270 cu in. Offenhauser engine, Hilborn fuel injection system, Hunt magneto, Halibrand quick-change rear end and spot brakes, and Monroe telescope-type and Houdaille vane-type shock absorbers on each wheel.

The entire exhaust system is inside the body shell. New type exhaust headers and tail pipe designed by Southern California Muffler Corp. should, they hope, broaden exhaust fume dissipation and equalize distribution in manifolding.

An innovation is the two-way radio for driver-to-pit contact. It should keep the driver up-to-the-minute on race developments and let him tip off the pit crew before he plans a stop. The set is in the cowling just behind the driver's headrest. The aircraft-type helmet has earphones and the driver wears a throat microphone.

There was a determined effort to get a Ferrari engine into the competition. A Kurtis-Kraft 500-D chassis was flown to Scuderia, the Ferrari plant in Modena, Italy, for installation of a 6-cyl Ferrari engine. It was planned that the completed car, along with spare engine, would be air-freighted back to

Indianapolis in time for the qualifying trials. Bardahl Oil Co., Inc., of Seattle, Washington, is the sponsor.

The six cylinder, 267 cu in. Ferrari is an entirely new engine of 4 in. by 3.54 in. bore and stroke with light alloy cylinders and crankcase, nickel steel cylinder liners, a seven-bearing crankshaft and two gear-driven overhead camshafts operating a pair of valves per cylinder. Two Marelli magnetos are mounted vertically at the front and fire dual spark plugs placed vertically in the head. Thin-wall bearings are used for both connecting rods and crankshaft. Lubrication is by pressure and scavenger pump to all bearings. Three double-throat Weber carburetors are used.

Compression ratio is 9.5 to 1, and Enzo Ferrari stated that power output was 380 at 6000 rpm. Weight of the engine is 378 lb with all equipment, including clutch.

Enzo Ferrari is convinced that to compete with any degree of success in the Indianapolis race it is necessary to make use of an American chassis designed for the special conditions prevailing on the Indiana track. It is for this reason that the Kurtis has been sent over. A Meyer & Drake transmission was flown to Italy and tests were carried out at Monza, where speeds equal to those at Indianapolis are obtainable. It is not intended, however, to rush the preparations to get the car over for 1955. In fact, Mr. Ferrari said that he did not expect the car to run at Indianapolis this year.

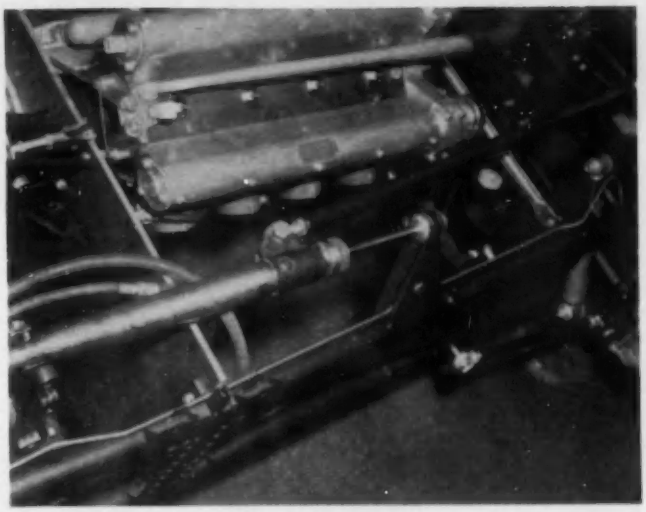
A new roadster-type racer, built by Eddie Kuzma for Dean Van Lines, will have 1954 AAA champion Jimmy Bryan as driver. The car, of tubular frame construction, has a Meyer & Drake 270 cu in. engine.

Interesting design feature is a split tail section to permit easier and faster maintenance. Instead of the customary single shell construction, this tail section has upper and lower halves that work somewhat like giant clamshells.

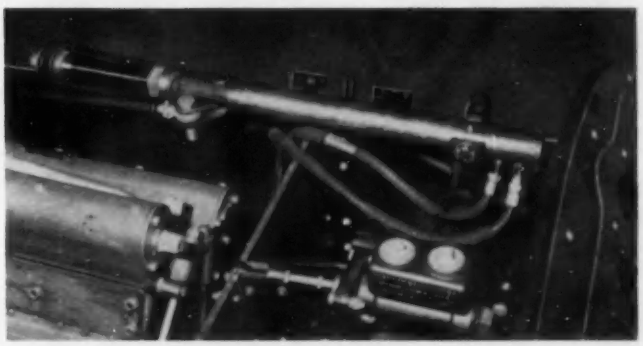
The exhaust system follows a design trend seen on several cars this year. Exhaust is led out at the bottom alongside the car.

Designer of the Dean car rounded out body panels for better reduction of air drag. The streamlining effort is just short of the radical design changes of the Kurtis-built Sumar car, and the Belond streamliner.

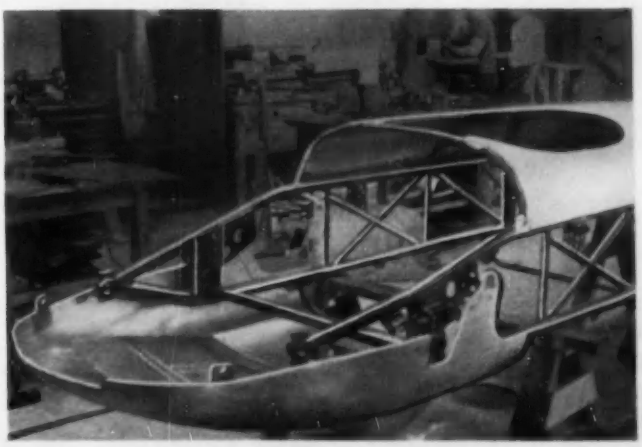
(*Turn to page* 116, *please*)



Power steering mounted on the Bolanger Special, a new Model 500D built by Kurtis-Kraft. The over-all mounting. Note at lower left hand corner, pitman pin through the valve section of power cylinder is attached to pitman arm. With piston rod attached to frame bracket, the short drag link connects the cylinder body to the steering arm.

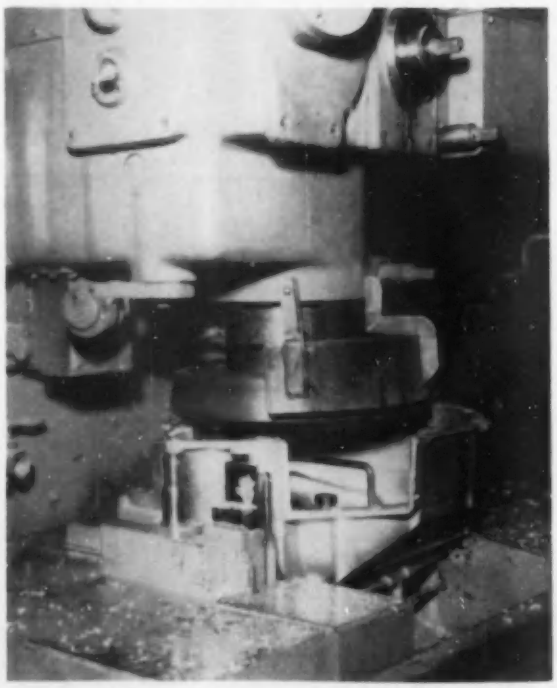


Detail of power cylinder. Note pitman pin through valve section of power cylinder connecting to pitman arm.



New Dean Van Lines car built by Eddie Kuzma. Tubular frame construction. Car features a two-part tail section for easier, faster maintenance. Photo shows lower half of tail mounted on car.

Close-up of work-station of one of the large Buhr drilling machines in this department. This one is a six-head machine, fitted with an indexing table and double-index fixturing for completing all operations on an aluminum servo body.



Work station of large vertical type Sundstrand milling machine for finish milling motor mounting face of converter housing.

Many Applications

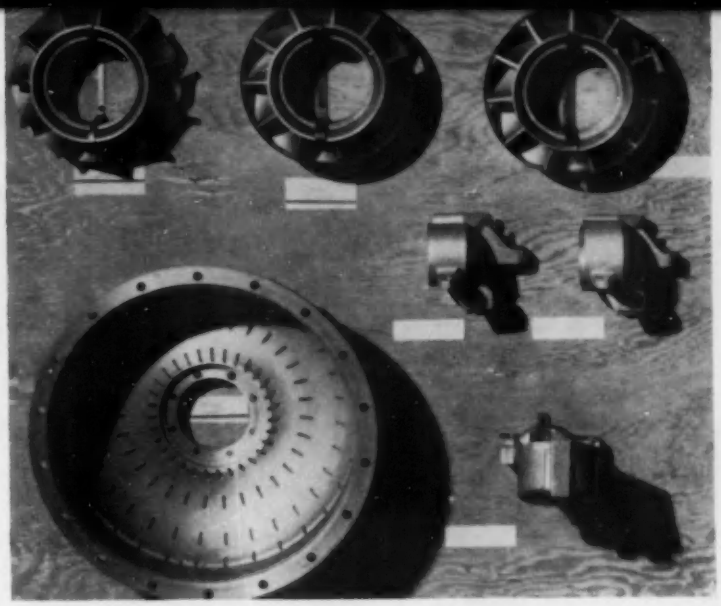
ALUMINUM alloys have found many economic applications in most modern automatic transmissions. Automatic drives for Lincoln and Mercury cars, produced in the Ford Livonia, Mich., plant, employ a considerable number of die cast aluminum parts, the latest count putting it at 38 different pieces, some interchangeable on both assemblies. These parts range in size and weight from a small pulley, weighing but 0.5 oz, to the converter housing that weighs 18 lb.

The initial article on this plant (see AI, November 15, 1954) mentioned that because of the variety of materials used in these drives, each type of metal is machined in a separate area. This makes it possible to segregate all aluminum machining, for example, centralizing all associated machining and process equipment as well as facilitating segregation of cutting fluids and chips.

The present article is concerned exclusively

for Aluminum in AUTOMATIC DRIVES

By Joseph Geschelin



Display of a few of the aluminum parts used at the Livonia plant. Other parts include the variety of valve bodies and transmission extensions.

with a sampling of aluminum parts manufacture, noting only tne highlights of selected operations.

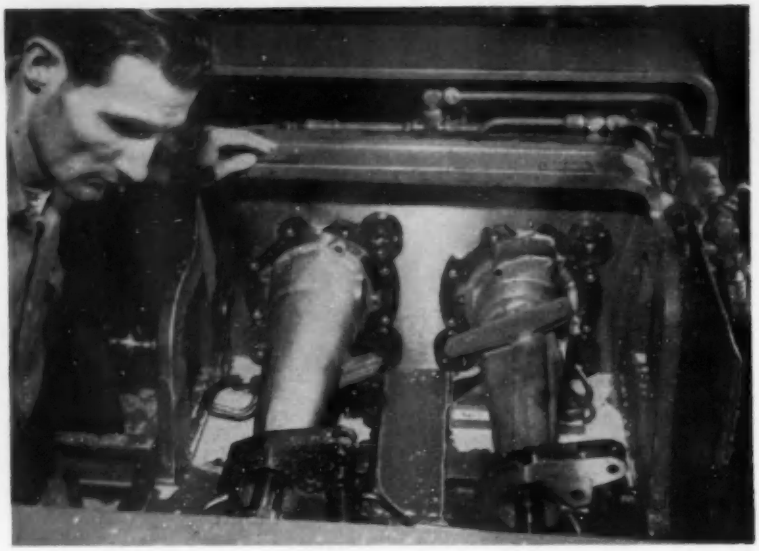
Before giving some of these details it is of interest to note that aluminum machining has been given special treatment, particularly as to the selection of cutting fluids, the widest practical utilization of cemented-carbide tooling, and the establishment of the most economical cutting speeds and feeds consistent with the design of specific machine tools. It may be noted, too, that where precision-boring equipment is employed for the relatively small diameter bores in valve bodies, Ford has found it much more economical to employ cemented-carbide reamers instead of the usual boring bars and fly-cutters.

Because the valve bodies are quite slender and can be easily distorted while clamping in work-handling fixtures, it will be noted that Ford has developed special fixture designs, employing in some cases hydraulic clamping arrangements that support the work against cutting pressure. Too, this department has been provided with a large battery of Maizo Blast machines for deburring finished parts. Valve bodies and other parts that require flat parallel faces are given a lapping treatment in familiar equipment such as Micromatic Microflat and Norton Hyprolap machines.

The control valve lower body, largest of the valve

Close-up of indexing table of special six-station Morris machine. Lower control valve bodies are drilled, reamed and tapped in both faces in a double-index cycle.

bodies produced in this plant, weighs 1.3 lb. First major operation is the facing of the two faces, essentially a milling operation, using facing tools with cemented-carbide inserts. This is done in a special Heald precision-facing machine, provided with a trunnion-type, disk-like fixture that makes it possible to mill both sides simultaneously. Drilling, reaming, and taping of holes in top and bottom faces is done in large special six-station Morris drilling machines, arranged for double-indexing. Some of the long holes are drilled in two or three steps to permit correct axial alignment. Following this the parallel faces are finish-faced in another of the Heald facing machines.

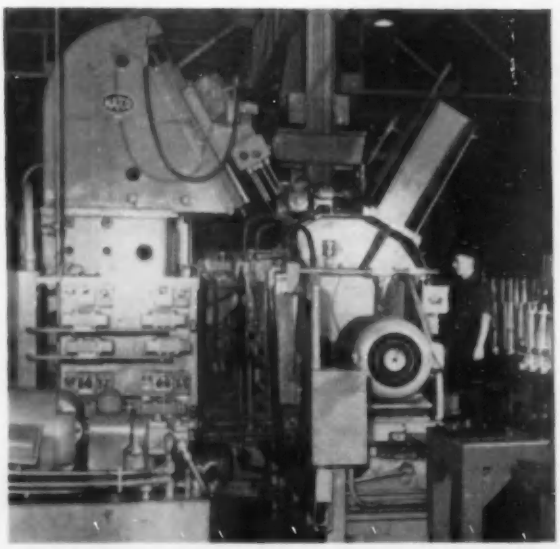


Work station of special Heald, six-spindle precision-boring machine on the transmission extension line. Holding two pieces at a time, it finish-bores the flange end and small end, counterbores and faces the thrust boss.

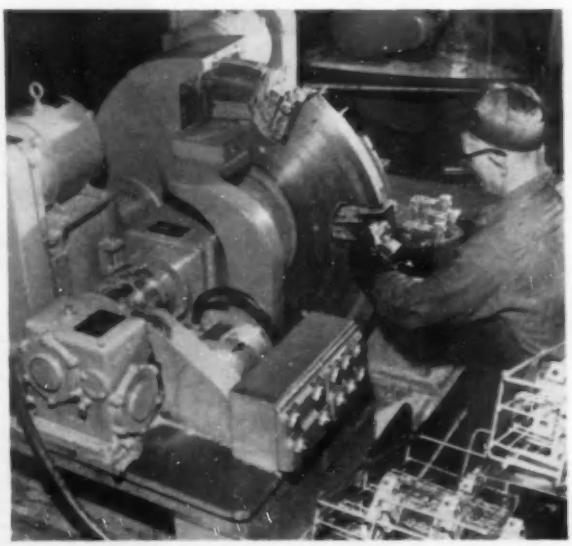
Core-drilling and semi-finish-reaming of bores, and tapping of miscellaneous holes is handled in another group of special 10-station Morris machines of indexing type.

Precision-boring of the stepped valve bores is the last major operation, handled in a No. 232 special Heald Bore-Matic of double-end, four-spindle type, provided with a trunnion fixture. It is noteworthy that this operation, normally considered as precision boring is actually performed with cemented-carbide reamers, since Ford has found reamers to give longer life and produce better bores than the usual fly-cutters.

(*Turn to page* 130, *please*)



Perspective of large Natco special machine on the transmission extension line. It handles the boring, counterboring, and spot-facing of speedometer and inspection holes.



Facing of both sides of the lower control valve body is handled in the special Heald precision-facing machine seen here. Parts are loaded manually into the trunnion fixture.

New Planetary Drive and Drive Steer Axles

For application in heavy duty, four-wheel drive equipment such as graders, scrapers and other off - the - road vehicles, Clark Equipment Company's Axle Division is offering a new line of planetary drive and drive-steer axles.

The drive-steer axle is now being produced in 11,000, 17,000 and 20,000 lb capacities. Of similar design, the companion line of drive axles is available in 16,000, 17,000, 24,000 and 30,000 lb capacities. By replacing the conventional differential carrier with a through - drive type, the smaller axles in this line can be converted into tandem units.

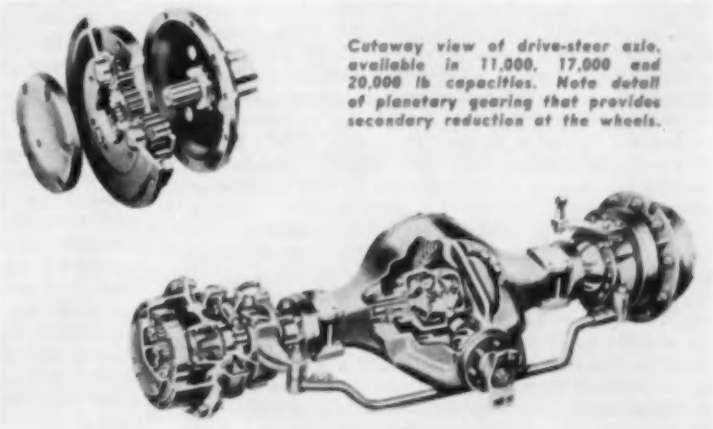
Use of planetary type drives at the wheel end of the axles puts the final power multiplication as close as possible to the point of application, a desirable characteristic in the transmission of torque. It makes possible a substantial size reduction in the steering joint, axle shafts and differential without any sacrifice in structural strength. The smaller differential is said to be particularly advantageous because of the close clearance with the motor pan encountered in tractor shovels and similar equipment.

Other advantages claimed for these planetary drive axles include elimination of torsional wind-up in the drive shaft and surging in the vehicle for which they are used; added operational safety because of the low torque load on differential, ring gear, pinion and drive shaft; secondary reduction assembly readily accessible for maintenance; and ease of maintenance because of lighter construction of components.

All shafts are heat-treated alloy steel. Gears are forged alloy steel, case hardened and heat treated. Extra heavy tapered roller bearings are used and mounted in adjustable cases to provide and maintain gear positions.

Depending upon the specific application, axle housings are either cast steel with heavy sections, or one piece heat treated and hot formed tubular type.

Cutaway view of drive axle, available in 16,000, 17,000, 24,000 and 30,000 lb capacities.



Cutaway view of drive-steer axle, available in 11,000, 17,000 and 20,000 lb capacities. Note detail of planetary gearing that provides secondary reduction at the wheels.

Mergers and the Monopoly Myth

Consolidation of Manufacturers Has Resulted in Greater Economies

By Paul H. Banner

THE success of the Ford Motor Co. in attaining the greatest share of the market that any firm ever acquired was accomplished by concentration, beginning in 1908, on one automobile—the Model T. The firm's sole acquisition of another automobile maker, the Lincoln Motor Co., contributed little to the size of the firm but did result in a drain on profits for many years.[1]

General Motors did not surpass Ford by merger but by growth. Initially Buick sales alone exceeded Ford sales but beginning in 1910 General Motors' leadership was lost and it did not again achieve leadership until 1927 when it attained 42 per cent of the market. The Chrysler Corporation's purchase of Dodge doubled the former's market share but this was still less than it achieved years later. In many cases merger was indicative of weakness. A host of small, weak firms have not added up to one strong firm merely by merger.

Among other mergers and consolidation efforts can be mentioned the Studebaker organization and the Cord interests.

First Studebaker Merger

Studebaker, originally a wagon manufacturer, very early experimented with automobiles. When the Everitt-Metzger-Flanders Co. was organized in 1908 Studebaker became its selling agent, marketing Studebaker-EMF cars through its well-organized sales organization. The arrangement lasted two and one-half years at which time Studebaker balked at taking the entire EMF output. EMF's threat to set up its own distributive organization resulted in a merger of the two firms. In 1928 Studebaker secured control of the Pierce Arrow Motor Car Co., a manufacturer of passenger cars primarily, and in 1932 acquired control of the White Motor Co., a producer of trucks. A consolidation with the latter firm was intended but never consummated because of a minority stockholder suit. In 1933 the Studebaker Corp. went into receivership which ended any possibility of consolidation. In the same year the Pierce Arrow Co. was sold at a loss. In the reorganization of the Studebaker Corp. its stockholdings in the White Motor Co. were distributed to creditors. The Pierce Arrow Co. was incorporated independently and an attempt was made to manufacture passenger cars. The firm was unable to exist in the depressed period of the Thirties and was liquidated in 1938. The White Motor Co. continued in operation successfully as a manufacturer of trucks.

Interlocking Firms

The Cord interests were never important producers of automobiles but illustrate the phenomenon of the Twenties —the holding company mushrooming by stock control into a fantastic array of interlocking firms. The Cord interests, selling the Auburn, Cord and Duesenberg cars, never represented more than two per cent of industry output. The holding company had interests in automobiles, aviation and shipbuilding. They included such firms as Auburn, Lycoming Manufacturing Co. (producer of engines for automobiles and aircraft), Limousine Body Co., Stinson Aircraft Corp., New York Shipbuilding Corp., Columbia Axle Corp., Smith Engineering Co. (which controlled the Smith Controllable Pitch Propeller Co.), Checker Cab Manufacturing Co., Aviation Corp. and other firms. The Checker Cab Co., 60 per cent of which was owned by Cord interests, had purchased its plant and equipment from the Handley Knight Corp., a manufacturer of passenger cars, and from the Dort Motor Co. Checker Cab Manufacturing Co. in turn owned a majority of the stock of Parmelee Transportation Co. which operated fleets of cabs in major cities.[2]

Aviation Corp. owned American Airways, Inc., which later became American Airlines. In 1937 the Cord Corp. went into bankruptcy and was reorganized under the name Aviation and Transportation Corp. It retained control of Checker and Parmellee but its holdings of American Airlines were distributed to stockholders of Aviation Corp., renamed Avco Manufacturing Corp. at a later date. The Auburn Co. ceased manufacturing automobiles in 1937 and turned to metal stampings, automobile bodies, kitchen equipment and other products built for manufacturers or distributors. In 1942 its name was changed to American Central Manufacturing Corp. To follow the development of this firm is complex. It ultimately was consolidated with Avco Manufacturing Corp. The latter firm had secured control of and sold various firms in the aviation and automotive industries. In 1951 it sold its holdings in American Airlines and ACF-Brill. A subsidiary of Avco continues to manufacture bodies for trucks.

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[1] Lincolns were rarely produced in sufficient quantity to reach a profitable level of operations until after the second war. The year 1929 was profitable—6359 units were sold at a profit of $2.3 million. In the same year profits on Fords were $49.0 million. From 1930 to 1937 losses on Lincoln and Lincoln Zephyr totalled $17.9 million. This was greater than the purchase price of the firm—$11.7 million.

[2] It is of interest that Yellow Cab Co., a subsidiary, has been a defendant in an anti-trust suit. The charge, upheld by the court, was that competition in the sale of taxicabs was restricted by the exclusive purchase agreements between the subsidiary operating companies and the Checker Cab Manufacturing Co. *U. S. v. Yellow Cab Co.* 67 S. Ct. 1560 (1947).

PART II

of Two Parts

The Cord empires does not seem to have been an effective force in the automobile industry except for its control over the taxicab market. Its three passenger car makes were all luxury models with small market shares. In order to enter the industry in strength it would have had to produce a lower priced car. The parent firm never seemed a serious contender for an important position in the automobile industry.

Capital Shortages

Briscoe's belief that capital shortages lay at the root of most merger attempts appears reasonable when the surviving firms are compared with those firms no longer in existence. It does not seem that producers were driven from the industry by merger waves or competitive warfare among the larger firms aiming at monopolistic control of the industry. Rumors regarding mergers frequently portended new bankruptcies in the automobile industry.

The mergers of smaller firms resulting from capital shortages were indicative of the development of the industry. In the early years of the industry producers were essentially assemblers who relied upon short-term credit to finance their operations. The introduction of mass production techniques which reduced the prices of cars markedly required considerable investment. Those firms which were unable to or did not choose to make such investments retreated to the high-priced car market where the introduction of mass production methods lagged because of lower volume of demand. This is indicated in the table in which the distribution of firms by price classes for 1916 model cars is given. In each case the price quotation for the cheapest model was used so that there is a downward bias in the distribution.

Price Brackets

The median firm was in the $801 to $1500 price bracket. For this same period a study of the distribution of factory sales reached the conclusion that the median price level was less than $675 and only nine per cent of sales were made at prices in excess of $1776'.

In 1923 the distribution of production by price classes was reported in the Census of Manufactures as shown in the table.

In this period the median price level was less than $500 per car. Thus, in a period of seven years which included a war period in which prices generally advanced, the median price of automobiles declined.

This decline in price was accompanied by a significant improvement in the product. It required greater technical skills and improved machinery to produce this improved automobile. The substitution of metal for wood, the popularity of the closed body, the increased fabrication in the power plant, and the rise in volume made necessary and possible the use of specialized heavy metal working equipment. While a tremendous capital investment was required it represented a lower per-unit cost.

In order to reduce costs heavy capital expenditures were required. The day of the assembler relying on short-term credit to finance operations passed. The producer of a small number of cars found his prices relatively higher and his market smaller as the median market price of cars sold declined. He could only operate at a very exclusive price level. Producers like Ford who continuously lowered prices put tremendous pressure on the industry, as reflected in the decline in the number of manufacturers. While the number of automobile establishments apparently increased until 1921, thereafter there was a continuous decline.[1] The depression beginning in 1929 accelerated the exit of firms from the industry though many firms had already been unprofitable for a number of years before the depression caused their liquidation. The firms that

NUMBER OF FIRMS BY PRICE CLASS FOR 1916*

Price Class	Number Firms
Less than $500	11
$ 500-$ 800	9
$ 801-$1500	30
$1501-$2500	27
More than $2500	16
Total	93

* Source: Model prices reported in *Horseless Age*, October 14, 1915, pp. 547-567.

DISTRIBUTION BY PRICE CLASS FOR 1923

Price Class	Number Produced
Less than $500	1,727,958
$ 500-$ 800	814,090
$ 800-$1500	664,189
$1500-$2500	170,948
Greater than $2500	42,340
Total	3,419,425

[1] Epstein, op. cit., p. 337.
[2] Based upon the number of establishments reported in the Census of Manufactures. This cannot be used as a measure of the number of firms since many firms operated more than one establishment, a customary practice in the automobile industry.

remained in the industry had to continuously increase their capital. The smaller firms disappeared.

High Output Essential

In his testimony before the Temporary National Economic Committee, Paul Hoffman declared that a producer had to reach an output of 100,000 units before he became competitive in the low-priced car market. At the same time the set of tools that could be used for 100,000 units is good for about 250,000 units before another duplicate set is necessary. In his opinion it was difficult for any company to build a small number of cars per year and be competitive.[7]

The combination of price pressure and improved product meant that smaller producers were inevitably forced out of the industry. The depression years with their resultant sharp decline in the demand for passenger cars forced all but the strongest firms out of the industry. Only one firm—General Motors—showed continuous profitable operations and not for all its cars. Chrysler Corp. operated at a deficit in only one year; Ford operated at a deficit from 1931 through 1933; Hudson from 1931 to 1934; Nash from 1933 to 1935; Packard in 1931, 1932 and 1934. Studebaker and Willys-Overland went into receivership but survived.

Few remember the many automobile firms that have been in existence. In 1914, 144 firms manufacturing automobiles were reported.[8] In 1915 the trade journal "Horseless Age" gave the price and specifications of automobiles produced by 120 firms.[9] The heavy mortality among producers can be seen in the prominence given in trade journals to sources of parts for orphan cars. In 1916 such a list in "Motor World" chronicled 160 orphans.[10]

DIVESTITURE AS A RESULT OF ANTI-TRUST ACTION

A major anti-trust suit leveled at the industry is not an impossibility. The court decisions in what have been labelled parallel action cases indicate a basis for suit. Various practices of producers in pricing their product, factory-dealer relationships, and exclusive dealer contracts, could be utilized in an indirect attack upon the industry. An old-time Sherman Act conspiracy case, however, appears unlikely.

The Government is faced with impedimenta in launching a case. On the one hand, in cases in which collusion is not obvious and parallel action must be proved, economic criteria have become more important and the automobile firms can marshal considerable defenses. Secondly, while the evils of bigness are written into our laws, the requirements of technology demand adequate size and skills gained only in firms of large size. It does not appear that Defense production, for example, can be pushed onto small firms.

If we assume that the Government were to begin suit with divestiture as an avowed purpose, and the courts did accede to the Government plea for fractioning the industry, what would be the results? On the basis of the court's hesitancy in the Alcoa case, breaking up of firms would seem an unlikely prospect. But here is interesting speculation. General Motors has five passenger car lines; Chrysler, four; and Ford, three. Can these lines be separated from each other and twelve firms rather than three formed? If we look at the history of the industry a good forecast would be that all the resulting firms would not be successful. The depression experience indicated forcibly the economies of size and of interchangeability of parts among car lines. The firm with product lines covering the entire market was and is stronger than the firm serving only one price line. It is also a more flexible firm. For example, during the depression economies of scale were retained although volume of individual car lines fluctuated. The truck market is also illustrative of this. Efficient and low-cost truck output is dependent to some extent upon interchangeability of parts with passenger cars. Independent producers concentrate on the production of heavy and medium trucks while the output of light trucks has been concentrated in the hands of a few passenger car producers.

1954 NEW PASSENGER CAR AND TRUCK REGISTRATIONS

Per cent of total new registrations

Make	Passenger Cars	Trucks
Chevrolet	25.61	35.34
Ford	25.30	32.30
Plymouth	6.87	
Dodge	2.80	7.32

How large need a firm be to achieve the economies of size possible in this industry? Certainly Chevrolet and Ford are sufficiently large to assure themselves the technological advantages of size. In the case of other car divisions among the Big Three it is questionable. Until the postwar period Lincoln was a drag upon the Ford organization. Cadillac has not always been profitable. In the event of dissolution it is probable that each independent producer would attempt to increase his market coverage but the economies of scale in the industry suggest that all the new firms would not survive.

The Consumer and Mergers

The consumer's stake in competition is improved product at a reasonable price. How has he fared and how is he likely to fare? He has little to complain of historically and little to fear in the future. Persistent criticism of ornate cars and of the lack of a utility model suffers in the face of consumer preference among available models. In the postwar period larger, more expensive models have outsold lower priced models in the same car lines. Concomitant with a reduction in producers has come increased market power for the consumer and stiffer competition among remaining producers.

It is also questionable how much less choice the consumer has today. Years ago producers had fewer styles and models which they kept for a number of years before changing. In recent times the concentration of producers on high-priced lines has been reduced and in each price

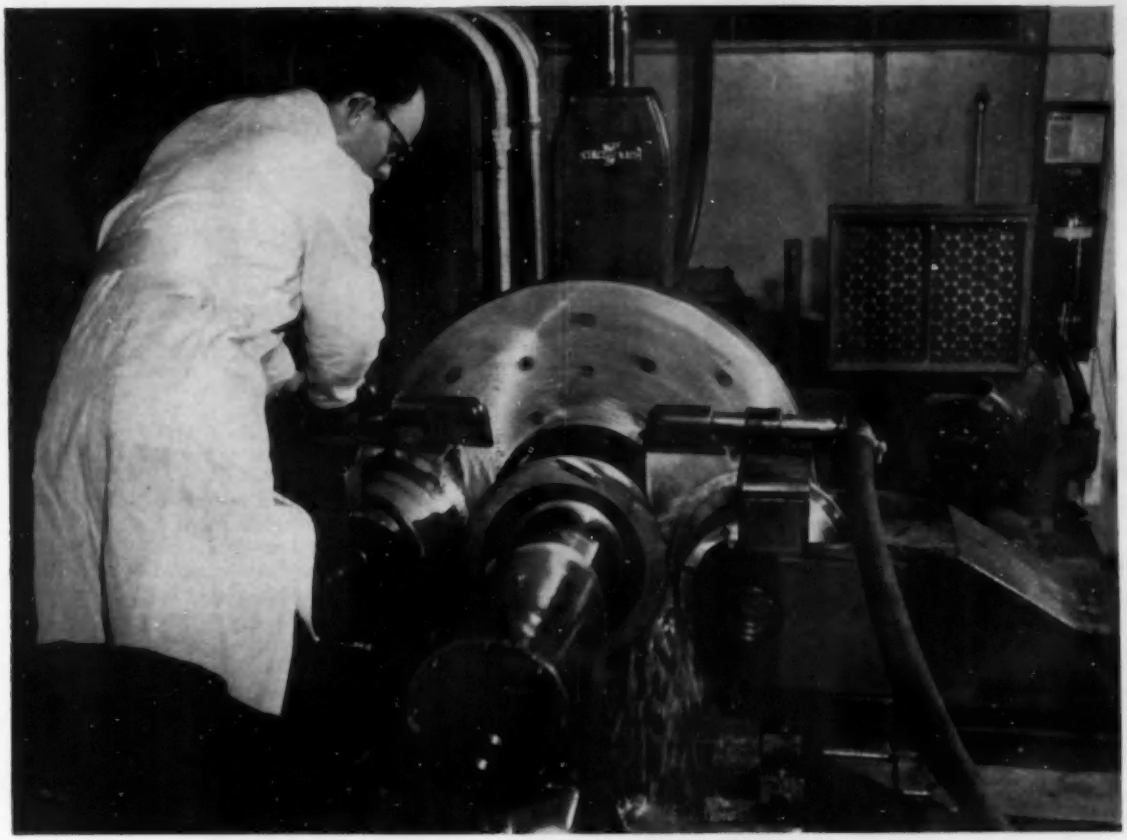
(*Turn to page* 182, *please*)

[7] U. S. Cong., *Investigation of Concentration of Economic Power*, Hearings before the Temporary National Economic Committee, Cong. of the U. S., 76th Cong., 2nd Sess. Pursuant to S.Res. No. 113 (75th Cong.), part 21, p. 11215. (Wash.: Government Printing Office, 1940.)

[8] *The Automobile*, XXX (Jan. 1, 1914), p. 10.

[9] *Horseless Age*, XXXVI (October 14, 1915), pp. 547-567.

[10] "Where to Obtain Parts of Orphan Cars," *Motor World*, XLVII (Apr. 5, 1916), p. 19.



New Hydrospin machine installed at Solar's San Diego plant

Aircraft Components Spun on Semi-Automatic Machine

A NEW machine tool, known as a Hydrospin machine, has been installed in the San Diego plant of Solar Aircraft Co. Valued at about $100,000, it was built by Cincinnati Milling Machine Co.

In operation, a blank metal disk is rotated at high speed. As it spins, two heavy-duty steel rollers force the material being worked to cold-flow onto a rotating mandrel. Pressure comes from four 50-ton hydraulic cylinders operating at 2500 psi. Stock up to 42 in. in diameter can be handled, and the machine has successfully formed inch-thick mild steels and ¾-in. thick stainless steel. A five-ton bridge crane services the machine.

A major use for the Hydrospin is the production of dome-shaped contoured parts. In the past they have been fabricated at Solar in two sections and welded together, requiring both special dies and fixtures. On the Hydrospin they are simply formed from a blank disk. On many parts, only one-fourth as much material is required to Hydrospin the part as to produce it from a forging, and production time is said to be much less.

The Hydrospin machine is designed to machine trim parts in place after forming. It can also be used to make seamless tubing and for the manufacture of tapered sheet stock. In addition, it is possible to roll castings and change the structure of the material, producing a wrought structure. It is also possible to produce a perfect sphere from two cold-formed hemispheres rolled on the Hydrospin and joined together. Both stampings and castings can be held to micrometric tolerances on the machine.

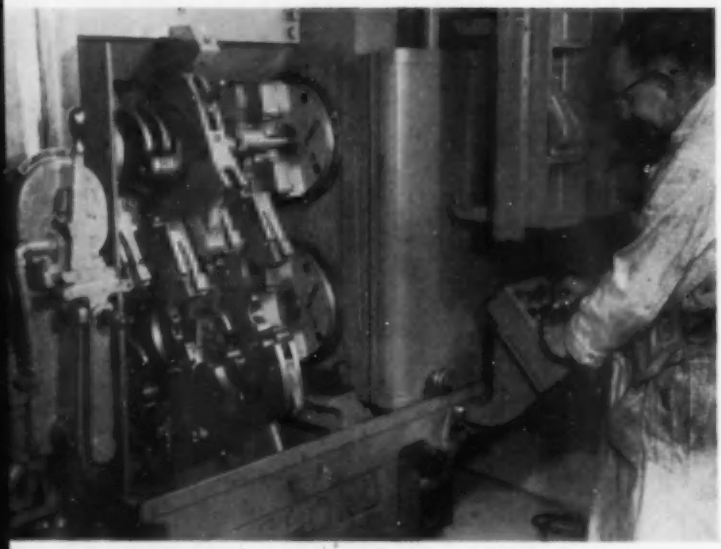
The machine is semi-automatic—once the adjustments are set by an operator, various stops in the work cycle proceed automatically, except for loading and unloading. The Hydrospin is said to be the first machine of its type to embody the automatic features plus the additional ability to produce contoured shapes.

Solar will use the Hydrospin machine to manufacture jet engine and other high temperature parts, such as jet exhaust cones. Numerous forming, welding and machining operations on the cones can be eliminated through use of the new equipment.

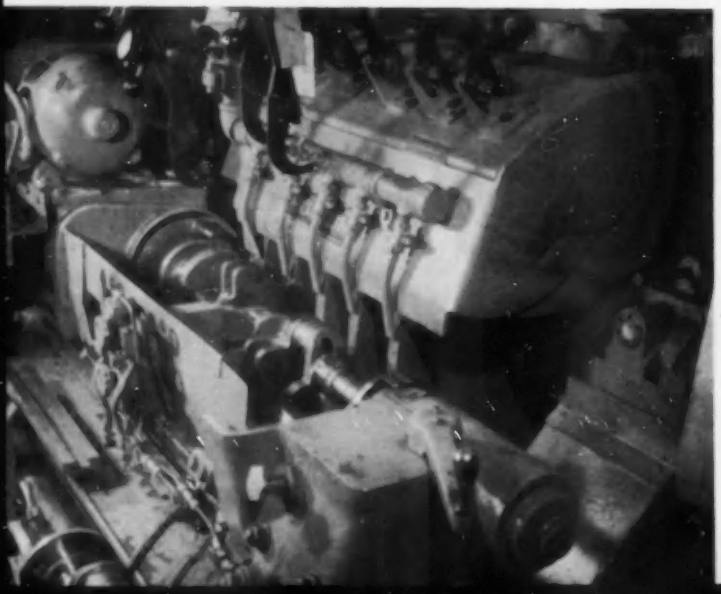
New Machines

By
Thomas
Mac New

Crankshaft being loaded into one of the Wickes machines where the workpiece is initially turned.



This automated LeBlond crankshaft lathe machines the crankpins to size.



MANUFACTURE of the 1955 OHV Packard engine not only meant the purchase of new equipment for the cylinder head and block lines, (AUTOMOTIVE INDUSTRIES, Nov. 1, 1954) but also for other engine parts throughout the remainder of the Utica, Mich., plant. In addition to the automatic machine tools utilized for head and block production, the corporation has its crankshaft and camshaft lines 85 per cent automated.

Production of the two shafts plus the water pump body, which is noteworthy because of its non-conventional design, are covered in this article. One of the major features of the crankshaft line is the use for the first time of an automated crankpin grinder. Built by Norton, this machine will be discussed in the sequence of operations.

Crankshaft castings—heat treated and centered—are first checked to make sure that there is 10 oz-in. of overbalance in proper position. During the first machining operation on a Sundstrand crankshaft mill, eight locating spots are machined.

In the subsequent operation, using Wickes lathes, the flywheel end is faced and the flange is finish faced on the pilot side and the front end. This machine is also utilized for turning the oil seal bearing, oil slinger, main bearing journals, and to face off the shaft to an overall length of 27.344-27.354 in. Various gages are used with the machine

Crankshaft Operations

Immediate left shows one of the Norton semi-automatic, multiple-wheel grinders used for the crankshaft main bearing journals.

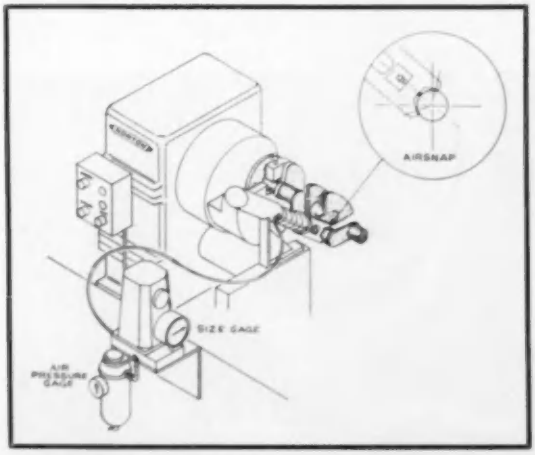
at Packard Used for Crankshafts and Camshafts

setup to facilitate the inspection of the workpiece.

All main bearing journals are then semi-finish ground in a Norton semi-automatic multiple-wheel machine. Grinding wheels range in face width from 0.841 in. to 2.060 in. Diameter of all wheels is about 36 in. Gages—Sheffield air type—are used to check shaft while laying in the unloading rack.

Crankpins are turned in LeBlond double-spindle lathes after the journal grinding phase. This metal removal operation cuts the crankpins to 2.282-2.278 in. diam by 2.109-2.105 in. wide. A 0.068 in. radius is also formed. For this metal-cutting process, as well as those preceding, carbide and high speed tools are used. The crankshaft is automatically loaded in the machine and then automated through the work stations.

During the ensuing machine operation, eight 0.219 in. diam oil holes are drilled in the shaft by special Leland-Gifford equipment. Probes are used during the course of machining to check out the oil galleries.



Schematic of the airsnap gage used in conjunction with the Norton automatic crankpin grinder. When the gage is actuated, an amber light operates. Pressure of the airsnap is set to initiate slow infeed. When the work reaches 'approach size' which is 0.0015 in. oversize, the green light goes on. A red light goes on when the finished size is reached.

Drills are 7/32 in. by 12 in. long. In the event of broken drills shafts are taken to Elox electron equipment for drill removal.

Main bearing journals are finished ground, using Norton multiple-wheel, semi-automatic machines, during the next production phase. The machines are similar to the type utilized for semi-finishing operations and were described above. Another group of Norton equipment is used for finish grinding the thrust face on No. 5 journal and the crank flange. Norton 10 by 36 angular grinders are utilized for finish grinding the pilot and face of flange from the front thrust face of No. 5 main bearing journal. Pratt & Whitney air gage equipment is used to inspect the product at this point. In order to finish grind the gear fit diameter and the adjacent face, the crank is fixtured in a Norton 10 by 36 angular grinder. The wheel used is a 30 in. by 2½ in. with a 60 deg bevel on one side and a 30 deg bevel on the opposite side.

After inspecting the shaft with Sheffield units, it is inserted in a 10-station, double-end Baker drilling machine. Here the workpiece undergoes drilling, reaming, counterboring, chamfering, tapping, and countersinking operations. An automatic inspection station is included in the machine.

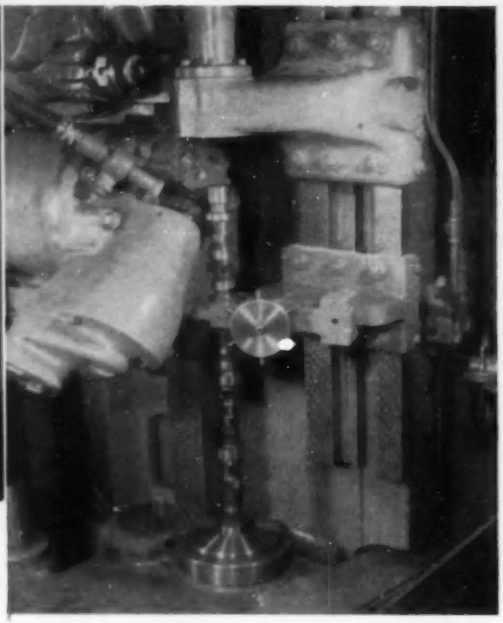
Subsequently, the pilot bearing hole is bored to 1.8500-1.8495 in. diam and 0.906 in. deep by a Simplex hydraulic boring machine.

At this point in the manufacturing operations, the crank is conveyed to the automatic Norton crankpin grinder. This four-station machine automatically transports the crank to each of the stations, loads, grinds all four pins, inspects, and automatically trues the grinding wheels. Motors used to drive the 42 in. diam wheels are set up to vary their speed in order to maintain a constant peripheral wheel speed as the grinding wheels are worn down. As a matter of interest, the machine is some 45 ft long and is powered by a total of 139 hp. Production of each unit is about 60 pieces per hr. Sheffield air gages are used for automatic size control of the work. A loading hook at each station locates the shaft angularly. Then when the shaft is placed in position, a rotating cam positions the crank longitudinally in front of the grinding wheel. Finally, a locating arm is used to properly position the shaft for the grinding operations.

Sundstrand machines are next utilized for milling the keyway in the gear fit diameter. An ensuing phase is to check the crank for straightness in an Impco hydraulic machine. If the workpiece requires straightening, the operation is performed in the Impco unit. All oil holes are then chamfered and then probed.

Gisholt dynamic balancing equipment which automatically checks out of balance and removes necessary amount of stock by drilling in counter weights at each end of shaft is utilized for checking out the shaft prior to polishing the bearing surfaces. After washing, shaft dimensions are inspected with a variety of gaging devices. *(Continued on next page)*

The camshaft gear is shaved in a National Broach Red Ring unit.



Lees-Bradner equipment is used for gear teeth on the camshaft.

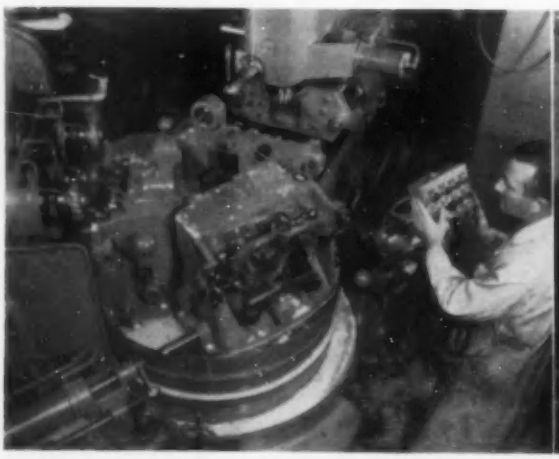
Upon receipt of camshaft castings, straightened, and with the cams flame hardened, Packard inspects them for center, depth and spacing of the cam lobes and bearing journals.

The first machining operation is done in a Seneca Falls two-station lathe. Here all the bearings are turned and chamfered. Carbide tooling is used for the job.

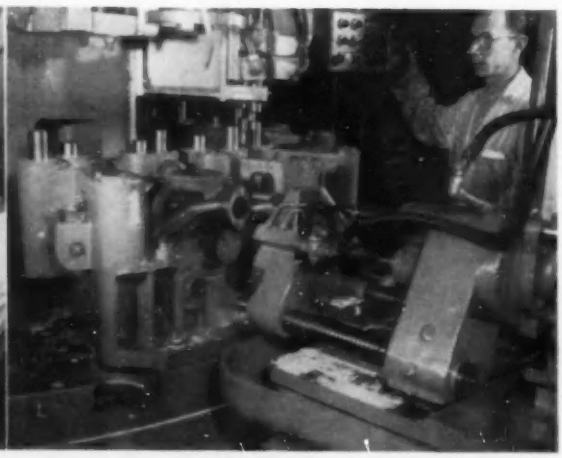
A Hartford Special four-station vertical trunnion machine is utilized for various drilling, countersinking, tapping, and milling operations. Various gages are used in conjunction with the machine tool to check out the workpiece.

The next major operation is performed on Norton multiple-wheel grinders which work on all five bearing journals and the gear diameter. To inspect the workpiece, a P&W air gaging machine is used. Another group of Norton grinders is used to finish the camshaft gear fit to 1.136-1.1355 in., and the thrust face to 1.375 in. from the end of the shaft.

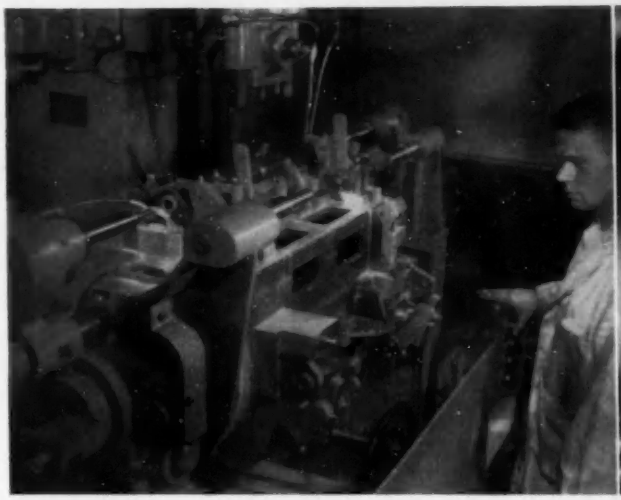
Complete operations on the cam lobes are performed by Landis cam grinders.

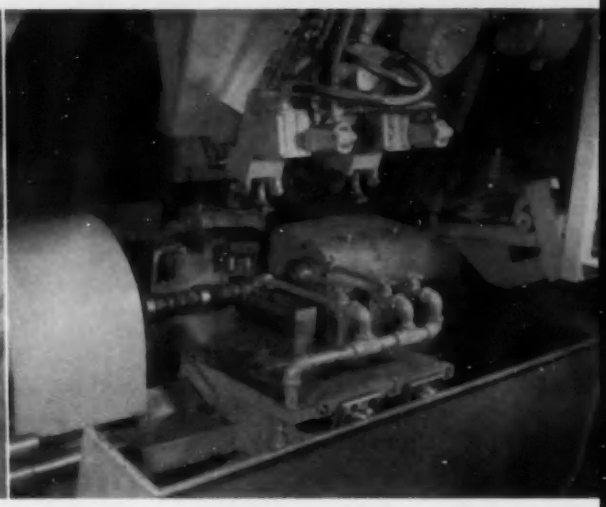


Initial operations on the new water pump body are carried out on this W. F. & John Barnes unit. The four pads are milled and the thermostat housing is faced.



Water pump bodies of new design are machined in two W. F. & John Barnes units. In this machine all drilling, boring, facing, chamfering, and tapping operations are performed.





Drilling, milling, countersinking, and tapping operations on the camshaft are performed in this Hartford Special machine.

Camshafts are automatically loaded and transferred to the cutting station for turning and chamfering bearing surfaces in the Seneca Falls machine shown in illustration on the right.

Camshaft Operations

Lees Bradner equipment is used to cut the camshaft gear teeth and Red Ring machines shave the gear.

For the final inspection, a Kodak contour projector checks the contour and timing of cams. P&W air gage units are used to check the bearings and base circle runout.

Pump Body Operations

One of the most unique engine parts on the new Packard V-8 is the water pump body. This component looks more like an intake manifold for a large four-cylinder engine. From the housing for the pump, it has legs to each head and each side of the V-block as well as to the radiator. The entire pump body is an integral iron casting.

In the first machining phase, the pump body is milled, drilled, and reamed in a W. F. & John Barnes three-station unit. Faces of the four mounting pads are milled and holes in the pads are drilled and reamed. Also, the face of the thermostat well is milled.

Barnes equipment is also used for the second and final stage of manufacture. Here, the unit utilized is an eight-station, center column machine for boring, facing, drilling, chamfering, and tapping. After loading, the 4.000 in. ID pump housing is bored and the bolt hole flange is faced at the second station. At the next station, the vertical head is used to rough plunge face the 17½ deg angle surface in the upper chamber of the water pump body. Boring and counterboring operations are performed by the side head at the third station. Four operations are carried out at the ensuing station. The cover surface is finish faced, the pump housing is finish bored, the 17½ deg angle is finish faced, and the 0.500 in. hole through the inner face of the thermostat well into the lower chamber is drilled. Various drilling, spotfacing, chamfering, reaming, countersinking, and tapping operations are carried out at the four subsequent stations.

After machining and washing, the component is removed from a conveyor and bench inspected with a variety of hand gages.

• • •

Zeder Cites Work By Car Makers Done on Smog Problem

James C. Zeder, engineering vice-president of Chrysler Corp., recently gave an idea of the extensive studies being made by the automobile industry on the smog problem. In a talk before the National Air Pollution Symposium in Pasadena, Calif., he noted that at present there are 26 research specialists working full time on various phases of the research program at seven companies.

Outlining the studies being made on reducing hydrocarbon in engine exhaust gases, Mr. Zeder observed that five companies have in various stages of development one or more devices to limit manifold vacuum or to reduce fuel flow during deceleration.

Tests show that during deceleration small amounts of unburned fuel are most likely to be present in engine exhausts. It is not known yet, however, whether these hydrocarbons contribute to the pollution problem.

In the continuing overall program, one company is concentrating on a fuel injection device to improve combustion, and several others are said to be working on this approach. At least two companies have explored after-burners, and two are working on a catalytic muffler.

New Automatic Techniques Featured

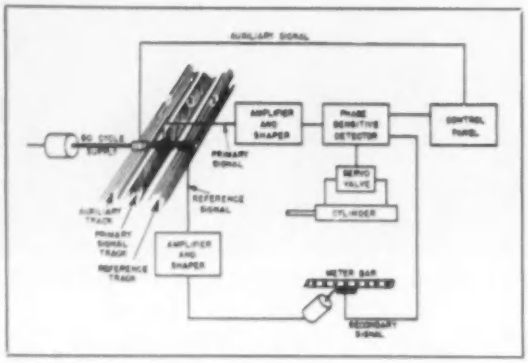


Fig. 1—Basic Elements of magnetic tape machine control system

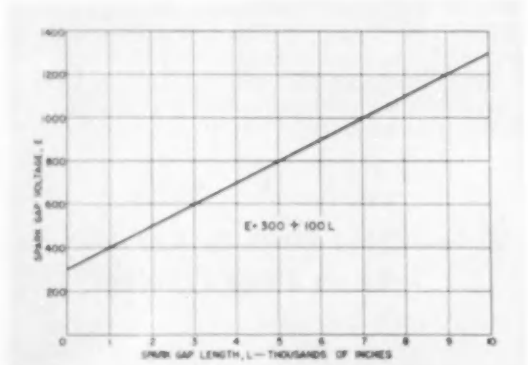


Fig. 2—Relation between spark gap length and spark gap voltage

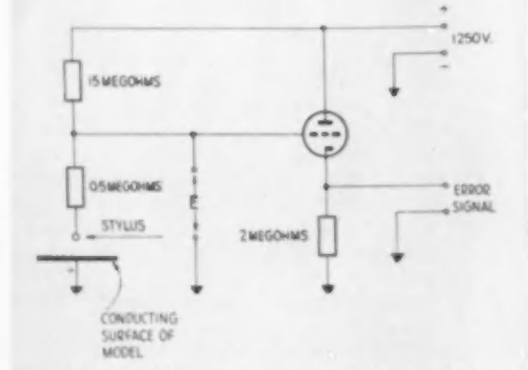


Fig. 3—Circuit used to produce spark and obtain a useful error signal

THE continuously growing interest in controls for high-production new machines, and for equipment now in use, was shown by a record-breaking turnout at the 19th Annual Machine Tool Electrification Forum sponsored by Westinghouse Electric Corp. at Buffalo, N. Y., last month. Registrations for the two-day event totaled more than 500.

A special feature this year was an extensive display of Cypak systems, the new industrial controls recently announced by Westinghouse which feature relays with no moving parts and switches with no moving contacts. See AUTOMOTIVE INDUSTRIES, May 1, pages 66 and 83.

Following a talk on the outlook for the machine tool industry by Tell Berna, general manager, National Machine Tool Builders' Association, D. C. Burnham, vice-president manufacturing, Westinghouse Electric Corp., said that automation is today's most controversial subject. Labor calls it a monster, an industrial demon that threatens to completely destroy the American way. Industry, rising lately to its own defense, says it will result in more and better jobs, products, and purchasing power. The man on the street is confused.

Continuing, Mr. Burnham said: "Afraid of borrowing trouble, industry has been slow with its word on automation, far too slow. Now we find ourselves in the rather ridiculous position of having to defend a manufacturing technique that is not only logical but absolutely essential to the growth and well being of our country. Labor has argued that industry has shrugged its responsibility as Americans by allowing automation to grow. The only responsibility that industry has shrugged is that of communicating to the people what automation is and what its effects will be. This is your challenge, and the challenge of every segment of industry that is at all connected with the growth of automation: to use every means at your disposal to make evident to the American people what automation is, how it has come about, and what it will result in."

Operation of machine tools from stored information is the promising newcomer to the control systems field, according to Leonard Hesse, chief electrical engineer, Gisholt Machine Co. He described the system as essentially an analogue computer used in a closed loop system. It provides a completely automatic machine cycle once the tape is fed in. The basic elements of the system, Fig. 1, are a multi-track magnetic tape, detector screws for each track, amplifier and shaper for all but one of the

at Westinghouse Machine Tool Forum

detectors and a control panel for that one, a reference meter bar and its associated detector screw and, finally, a phase sensitive detector and a hydraulic servo valve. The stainless steel tape can store information on several tracks.

E. E. Kirkham, project engineer, Pratt & Whitney Div., Niles-Bement-Pond Co., said that although tracer controls have perhaps made more headway in the field of automatic control of machine tools in recent years than any other type, some of their inadequacies have prompted the design of a tracer control that is based on an old yet uniquely applied principle—that the voltage across a spark gap will remain constant so long as the gap does not change. The stylus of this new tracer control never touches the model; it traces by maintaining a constant spark gap between the model and the stylus at all times. The result is a simple tracer control which exerts zero operating force on the model, which has a very high speed of response and a large output signal, and which has inherent flexibility.

The moving mechanisms in transducers used heretofore result in some time lag between change in error and signal output. The spark gap tracer is instantaneous in its action.

The relation between the spark gap length, L, and spark gap voltage, E, can be expressed by the empirical formula, $E = 300 + 100L$, Fig. 2. Spark gap length is measured in thousandths of an inch.

The circuit used to produce the spark and to obtain a useful error signal is relatively simple, Fig. 3. The large value of resistance in series with the stylus limits the current so that the spark is nearly invisible and is not destructive to the stylus and model. This current is also low enough that no harm comes to persons who touch the stylus. The 0.5 megohm resistor in series with the stylus isolates the lead wire capacitance from that of the spark gap itself, thus reducing the magnitude of oscillations which can exist within the arc.

A paper devoted to "Automatic Gaging—Automation's Sixth Sense" was presented by A. Wiseman, chief electrical engineer, The Sheffield Corp. Automatic gaging, according to Mr. Wiseman, has been and will continue to be closely allied with the growth of automatic processes. In fact, processes are no longer considered to be automatic if there is no provision for automatic inspection. The mod ern automatic gage can do much more than merely indicate if a part is or is not acceptable. It can have a vital role in determining production. It is a sensing device which can and does act on the information it receives. It can, for instance, determine if a machining process is under control and, if not, can initiate action to bring it under control or shut down the process until the proper adjustments are made.

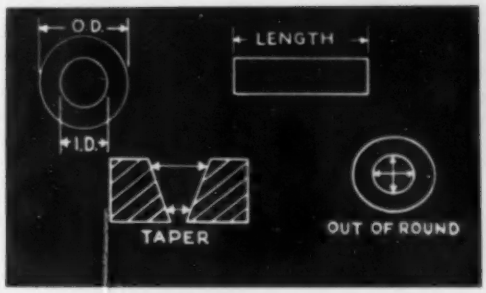


Fig. 4—Examples of size gaging

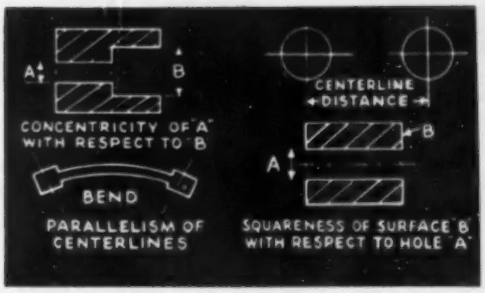


Fig. 5—Various types of location gaging

Size, dimensions, such as hole ID's, OD's, and lengths, and depths as well as out-of-round taper are very commonly gaged. So are location type dimensions such as concentricities, squareness, bend and twist, and center distance. (See Figs. 4 and 5.) Tolerances can range from a fraction of one ten-thousandth to many thousandths of an inch.

Commenting on tomorrow's automatic gages, Mr. Wiseman said that it is not too much to expect that machine tools will be designed with the gaging in mind at the time of the design. It is conceivable that size classification information from a cylinder bore gage, for instance, would be fed into a computer which would determine how many matching pistons of given size would be required at the engine assembly line. The computer would then feed this information

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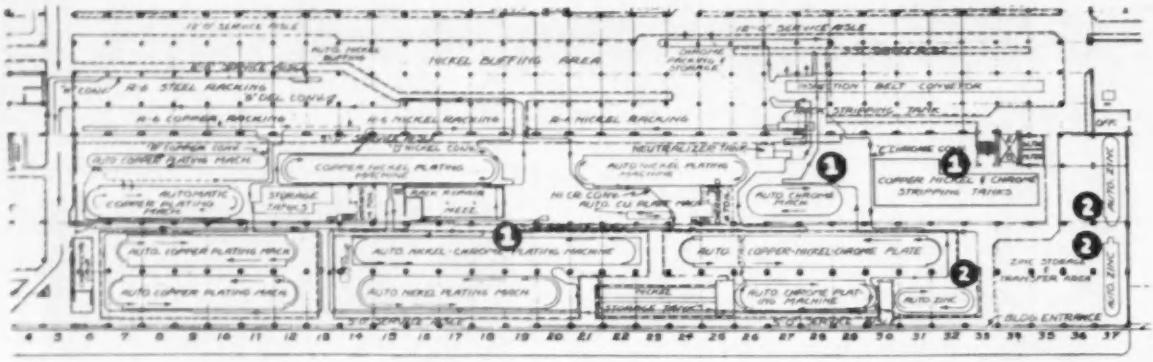


First floor plan of the Cadillac plating department. The two rows of automatic plating machines at the bottom represent new equipment installed recently.

Cadillac's Plating Plant Designed for Flexibility

DETERMINED to produce the highest specification quality electroplate known to the art, free from even the usual commercially acceptable flaws, Cadillac Motor Car Division launched an extensive program some time ago to realign its plating facilities and install new automatic plating equipment. This program also included the building of a three-story plant addition to provide the necessary floor space.

All of these facilities, including an impressive network of conveyor systems linking the entire operation, went into action in time to meet the requirements of the 1955 car building program.

The layout of the new plating department may be visualized from the first floor plan shown here. The first two bays from the outside wall—including two rows of large automatic plating machines—represent the new addition. The second floor, or mezzanine, of this area is devoted entirely to service equipment such as a variety of plating generator sets, rectifiers, air filtering equipment, exhaust systems, and numerous hydraulic pump and control sets for operating the plating machines.

By the very nature of the variety of product items requiring electroplating, the entire layout is designed for extreme flexibility. In addition to bumper parts of various forms and sizes, Cadillac plates numerous parts for the grille assembly, and other miscellaneous parts. Moreover, the department chromium-plates a large number of stainless steel moldings, as well as zinc die castings. Each type requires different handling, each one traces a different path through the plating department. Flexibility is paramount to a degree not contemplated in other motor car plants.

The quality of the plate produced here may be best appreciated by noting the specifications for steel and die cast parts. On bumpers the total thickness of the copper-nickel-chromium coating is very close today to the maximum GM standard of 0.003 in. Actually it lies between 0.002 and 0.003 in. as the top limit. To meet this objective, the copper coating is held to 0.001 in., while nickel is held to 0.0015 in. (min.). Zinc die castings have a total coating of around 0.002 in., holding bright copper to 0.0008 in., nickel to 0.001 in. Electroplating specialists will recognize that these represent the maximum quality obtainable in commercial high production practice.

Superimposed on the chemical control of the plating baths, there are stages of inspection at points to be noted later, permitting inspectors to reject work in various stages of plating as well as at final inspection after plating. Even the most minute blemish is cause for rejection at any stage.

An impression of the operation of the system may be gained from noting some of the major steps in plating bumper parts. Stampings first are routed to the fourth floor for buffing and polishing on the large automatic machines as well as on jacks. Following this, the various parts are transferred to the feeder conveyor for transport to the plating department on the first floor.

By Joseph Geschelin

The next operation is copper plating in one of the automatic plating machines. The work then is transferred to a conveyor line leading to the third floor where copper is buffed on automatic polishing machines, touched up on jacks if necessary. Again the accepted parts are transferred to a conveyor and are transported to a station on the first floor where they are transferred to racks leading to nickel plating.

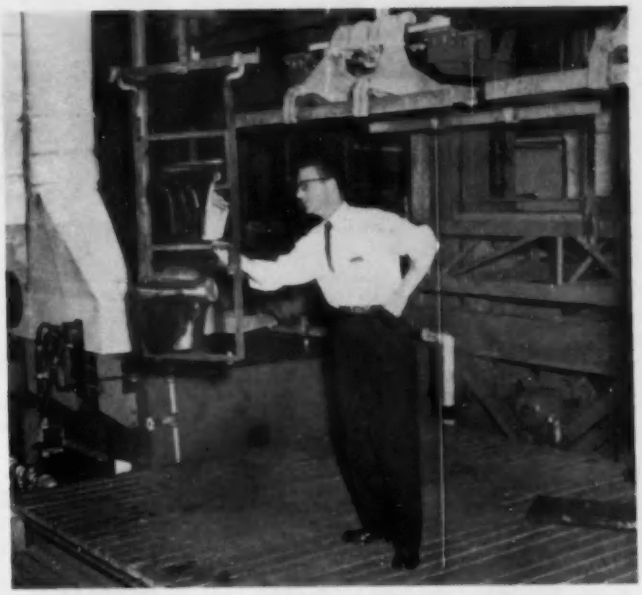
As the work enters the exit station of the big nickel plating machine, inspectors stationed at this point make a visual inspection for acceptance or rejection. If the reject is of such nature as to be repairable by further buffing or touch-up, the parts are routed to a suitable station where the repair is made by hand. Accepted parts, on the other hand, proceed on the conveyor to chrome plating.

Stainless steel parts are given a preparatory polish and buff on an automatic polishing machine, and proceed directly to chromium plating.

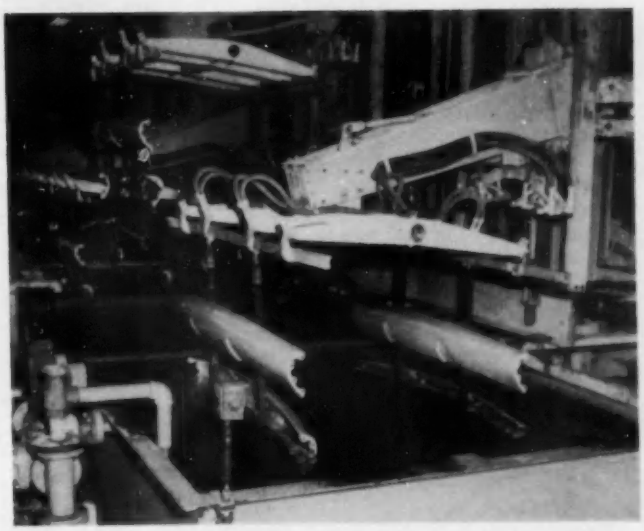
Examination of the layout will show the reader the variety of types and makes of plating equipment installed in this plant. Depending upon the nature of the work as well as its physical size, the various components are plated in big automatic plating machines of different types; some units handle only copper, some only nickel, some only chromium. On the other hand, there are combination plating units that handle copper-nickel, nickel-chromium, some that handle the complete triple-plate cycle of copper-nickel-chromium. Zinc die castings are the most prominent parts that are handled in a single triple coat cycle, employing bright copper and nickel.

Of the new equipment installed in the two bays of the new addition, the three units (marked 1 on the floor plan) are Udylite; the small zinc plating machine and the two barrel plating units at the extreme right (marked 2) were installed by F. B. Stevens. The rest of the equipment was supplied by Hanson-Van Winkle-Munning. One of the largest units is the HVWM triple-coating machine used for plating zinc die castings. Considering the tanks on both sides of the automatic conveyor, the unit has a developed length of 360 ft, and operates on a three-hour cycle.

The F. B. Stevens zinc plating units are used for producing a corrosion-resistant coating on a large variety of chassis parts of purely functional nature, such as washers and fastenings, rods, brackets, etc.—all manner of parts exposed to the weather. This treatment gives lasting protection against rusting, makes for neatness, and facilitates replacement. (over)



Typical inspection station on one of the multiple-plating machines. In this instance, work is being visually inspected as it comes out of the nickel section. Accepted parts proceed to chromium plate, while rejects are shunted out of the plating conveyor for salvage or polishing.



Perspective of portion of one of the automatic plating machines.

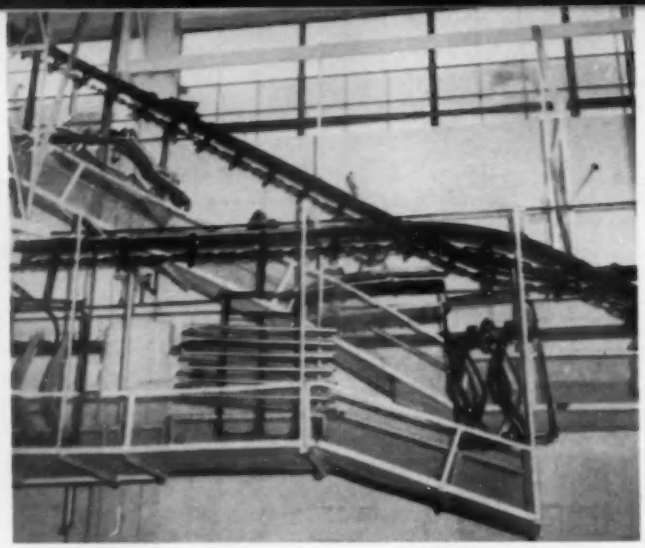
It is noteworthy that the entire installation was developed in advance by Cadillac process engineers versed in electroplating techniques, resulting in firm specifications on which the design of each machine was predicated. These specifications encompassed the process and special accessories and special cycles that have been evolved at Cadillac over the years. Consequently, the equipment installed here, although it may have the outward appearance of the customary plating machine, actually has many important differences in detail.

For example, each of the copper and nickel baths is provided with a heavy canvas diaphragm isolating the metal anodes. This has been the practice at Cadillac on copper plating tanks for many years but marks the first installation in nickel tanks. It is claimed to have many important advantages over the older method of "bagging" anodes individually.

The various rinse tanks also have been given special treatment. Instead of a steady flow from the nozzles in these tanks, each tank is served by an automatic motorized inlet valve, controlled by a Minneapolis - Honeywell timer mechanism, providing an off-on cycle of 15 seconds duration. This is said to improve the effectiveness of the rinse and conserve water.

Because the copper plate on steel parts is unusually thick, each of the copper plating tanks is controlled to provide an alternate plating and deplating cycle to assure uniform deposition.

The throwing power of the nickel plating tanks is so high that special means have been evolved to reduce the effect of current density at points and corners on many parts. This is done to prevent burning at these critical areas. In some instances, an auxiliary anode is attached at a critical point to effect better current distribution about complex formations. In oher instances, where protection is required against burning, a variety of current "robbers" of suitable formations are employed.



One of the numerous junctions of the system of monorail conveyors linking the polishing operations on upper floors with electroplating on the first floor.

This is one of the transfer stations. At this point, buffed copper plated parts are transferred to the conveyor line leading to nickel plating.

Electroplating is such a highly technical process that all of the equipment, as well as its various auxiliaries, is constantly patrolled by representatives of the chemical process engineer. These specialists work every shift, take samples and instrument readings of each bath at stated intervals. Everything that is known of the part today is employed in maintaining standard conditions.

Finally, it is important to note that with the establishment of this major plating facility, Cadillac has installed a comprehensive waste disposal plant to prevent pollution of city sewers. One of the most advanced installations of its kind, this facility is completely automatic in operation. It is arranged for the destruction of cyanides in one section; for handling acids and alkalis in another. In the case of acids and alkalis, the chemical equipment is so designed as to mix these liquids in proper proportions to provide a perfectly neutral waste product, harmless to the sewage system.

(*Turn to page* 132, *please*)

Aeronautic Developments Discussed at SAE Meeting

By Paul C. Kennedy

FROM automatic production to zero-length landing aircraft, some 400 engineers explored the year's developments at the Golden Anniversary Aeronautic Meeting of the Society of Automotive Engineers. The meeting and engineering display were held late last month in New York City.

Engineering discoveries and advancements in aircraft design occupied the group for the first three days. The recently-inaugurated, full-day production forum included seven sessions this year. John M. Tyler and Edward C. Perry, Jr., of United Aircraft Corp., were awarded the Wright Brothers Medal for 1954, for the paper "Jet Noise" presented at the meeting last year.

Powerplants received much attention. Expendable engines for missiles are hard or easy to come by, depending on whose experience is considered. J. D. Rogers of Westinghouse's Aviation Gas Turbine Div. said they can be made at a lower cost, but this was questioned by engineers from the Navy Bureau of Ordnance and General Electric. These latter commentators claimed development costs for expendable engines are about the same as for conventional engines, and that so-called short service life is usually by-passed in the final development anyhow.

Discussing basic design concepts, W. G. Lundquist of Wright Aeronautical Div., explained that some five million combinations of variables could be considered in a design. Eliminating nine-tenths of these by inspection still leaves an impractical number to be evaluated analytically. Fortunately, he explained, predicting the future from past trends is somewhat simpler. Greatest improvement will come from reduced drag losses, he said. Engines will be much larger, with fewer compressor stages. For civilian use, military engines will be used which are re-rated temperature-wise, despite the weight penalty. This loss is predictable, whereas unreliable performance is not.

Design criteria for a supercharged turboprop engine, the Bristol B. E. 25, were outlined by Dr. Stanley Hooker. It provides, uniquely, excess power for the transport for which it was developed, the Bristol Britannia. Takeoff horsepower is 4000. Operating details with the J-44 small turbojet engine were discussed by A. T. Gregory of Fairchild Engine Div. They might be used for boundary layer control, he said.

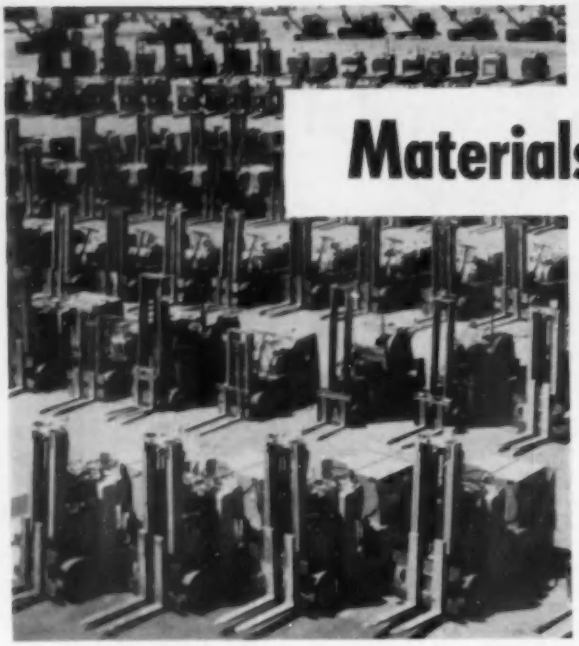
Accessory power trends, military and civilian, were discussed by a panel. Airframe builders would mount accessories directly on the engine, but engine makers and the Air Force were said to desire remote installations, driven by bleed air, for flexibility in usage.

Transport aircraft design received the attention of three panels as well as prepared papers. Details of the Trans-Canada Airlines' Vickers' Viscount turboprop transport were illustrated by J. T. Dyment of TCA. A history of the Lockheed Constellation was covered in a paper by H. L. Hibbard and C. L. Johnson, while the Douglas transport series was outlined by A. E. Raymond.

Noise control devices for flight and ground use were accounted by John Tyler of United Aircraft Corp. He showed an extendable nozzle design for the tailcone.

This year the Annual Aeronautic Production Forum held in conjunction with the Aeronautic Meeting was sponsored by George F. Chapline, vice president and general manager, Fairchild Engine Div. There were seven panels held simultaneously on the following subjects: engineering changes, techniques for improving factory communications, automation and its effect on manufacturing methods, quality control, electronics, and two panels on cost reduction. The guest speaker this year was T. P. Pike, assistant secretary of defense for supply and logistics. One of the features of his talk was on the standardization program setup for the Armed Forces. He cited instances where an astronomical number of similar parts have finally been standardized to just a few catalogued items.

One item of considerable interest stemming from the production forum was brought out by Robert Winblad, chief engineer of Cincinnati Milling Machine Co. He stated that carbide tools give two to three times more production if sharped by the electrical discharge method than by conventional means. According to Mr. Winblad, Cincinnati utilizes several Elox machines for just that purpose. There was also a lengthy discussion on Hydrospin, Floturn, and other cold forming processes. Engineers seemed to be in agreement that most components would have to be redesigned if they are to be produced by cold forming. Automation, naturally, was a much discussed subject during the meeting. It was agreed that automation will come to the aircraft industry providing it has design stability—something that is not likely except in wartime. Automation can be used, however, if there is a desire to maintain a constant quality and a minimum of scrap losses. Smaller firms were advised by Everett Dennison of General Electric Co. that automation might keep them from being priced out of the market. If lack of engineers is the problem, valuable help can often be obtained from makers of machine tools and materials handling equipment, said L. O. Carlsen of Gleason Works.



Materials Handling—1955

"The Concept of Obsolescence" is the Theme of the 6th National Materials Handling Exposition and Conference in Chicago this Week

SYSTEMS of materials handling, rather than single pieces of machinery, will be emphasized at the Sixth National Materials Handling Exposition at Chicago's International Amphitheatre, May 16-20. This is the first show to use the newly-built hall, plus the older building.

Theme of the show will point out that industry's major area for cost reduction is in materials handling. Also, that recent advances in equipment and techniques now require more from management than mere basic acceptance of the concept of modern materials handling.

The Conference, sponsored by the American Materials Handling Society with the Chicago section as host, is planned to offer a discussion of 29 subjects by 45 executives in many industries. Topics range from warehousing, receiving and shipping, to equipment ownership vs. leasing, relation of handling to plant layout, and integrating new systems with current plant facilities (see program at left).

Attendance is expected to top 25,000, with about 250 exhibitors showing some $10 million worth of equipment at the show.

Beginning on the opposite page are previews of some of the newer materials handling products and systems of particular interest to automotive and aviation manufacturing executives.

PROGRAM—CONFERENCE OF AMERICAN MATERIALS HANDLING SOCIETY

MONDAY, MAY 16, 10 AM TO 12 NOON

Materials Handling in Today's and Tomorrow's Economy
Douglas A. Gillespie, Northern Electric Co., Ltd., Montreal, Que.
National president, American Materials Handling Society

Role of the Materials Handling Engineer in Cost Reduction
Lynn J. Riege, engineer, materials handling equipment
U.S. Gypsum Co., Chicago, Ill. Conference chairman
6th National Materials Handling Conference

Keynote Address: Fred M. Gillies, president, Acme Steel Co.
Riverdale, Ill.

Effect of Obsolescent Materials Handling Equipment in Today's Production Costs
Fred V. Gardner, management consultant, F. V. Gardner & Associates
Milwaukee, Wis.

Recent Advances in Materials Handling Equipment and Techniques and Their Effect on Today's Production Problems
Speaker to be announced

TUESDAY, MAY 17

Panel A (9 a.m.-12 noon) **Receiving, Warehousing and Shipping.** Moderator: Irving Footlik, materials handling consultant, Irving M. Footlik & Associates, Chicago, Ill. Speakers: **"Storing by Popularity."** William Mackey, superintendent, warehousing, Calumet Industrial District, Chicago. **"Storage Space Layout."** Andrew J. Briggs, Bureau of Supplies & Accounts, U.S. Navy, Washington, D.C. **"Better Allocation of Space to Reduce Inventories."** George E. Whitfield, general operations manager, Butler Brothers, Chicago.

Panel Members: Walter Brager, production control manager, Oscar Mayer Co., Madison, Wis.; Raymond B. Mansfield, materials handling engineer, Zenith Radio Corp., Chicago; Harry C. Madsen, Corn Products Refining Co., Argo, Ill.

Panel B (9-10:30 a.m.) **Equipment Ownership vs. Leasing; Replacement and Maintenance.** Moderator: Howard Bernstein, president, Atlas Lift Truck Rentals, Inc., Chicago. Speakers: **"Advantage of Liquefied Petroleum Gas for Industrial Trucks."** Cleve T. Hendrix, president, Industrial Gas-Truck Engineering Co., Chicago. **"Advantages of Rental or Leasing Agreements."** Frank J. Babcock, president, Universal Material Handling Corp., Flint, Mich. **"Automation Replacement."** Henry F. Fernstrom, sales engineer, Barrett-Cravens Co., Northbrook, Ill.

Panel Members: Henry Limbright, materials handling manager, Ford Motor Co., Detroit, Mich.; Miles J. Rowan, managing editor, "Modern Materials Handling," Boston, Mass.; Therman O. Darnell, Dow Chemical Co., Madison, Wis. (*Continued, page* 198)

6th National Materials Handling Show

CHICAGO
May 16-20

Conveyor Belt

This Koroseal conveyor belt is a feature of the new line of "Automation" belts introduced recently. It is shown handling heavy boxes of antifreeze. Its smooth, low-friction surface permits boxes to stop for load-

ing and stamping while the belt continues to move, sliding under the boxes without signs of wear. Other belts in the line include Highseal in an eye-rest green color for light industrial inspection uses, Cariall all-purpose belt with an oilproof rubber cover for light applications, and Economy belting for low-cost operation. All feature C. P. special conveyor fabric impregnated for high resistance to moisture. *B. F. Goodrich Co.*

Circle 46 on postcard for more data

Operatorless Trucks

The illustration shows a fully loaded tractor train making its way, without an operator, through a plant to the shipping room. The train follows a route set by a guide wire strung from the ceiling overhead. This train, called Guide-O-Matic, will be shown in operation.

The truck or tractor is completely automatic. Neither operator nor physical connection is required for its operation. The load moves in a steady path to its destination, at any speed desired, under automatic control at all times.

The radio waves that control Guide-O-Matic trucks are transmitted over the wires by means of signal boxes installed at desired locations throughout the plant. To call a truck, simply press a button and the truck will come immediately to the station from which the signal originated. Retrace accuracy is said to be better than ± ½ in.

A "sniffer" box mounted on the truck or tractor picks up waves from the guide wire overhead. The sniffer box contains an electronic brain that

answers command instantly, causing the tractor train to follow the route set by the guide wire. These routes can vary, with many destinations served automatically.

The guide wire is easily strung from the ceiling along the desired routes and into bays, stockrooms and shipping rooms; or it may be laid in a small slot in the floor. *Barrett-Cravens Co.*

Circle 47 on postcard for more data

Chain Hoist

An electric chain hoist, known as the CM Lodestar, features shock-proof push button control, sealed-in lifetime lubrication, self-adjusting heavy duty brake, overload protection, fully enclosed and protected components, safety limit switches, light weight, and compact size and low headroom.

A unique jam-proof chain guide and non-kinking flexible link "CM-Alloy" chain permit the hoist to be used for extreme angle pulling. The single phase model (without contactor) can be used for side pulling. It can also be used upside down for odd jobs where it is inconvenient to install a hoist overhead. Used this way, the

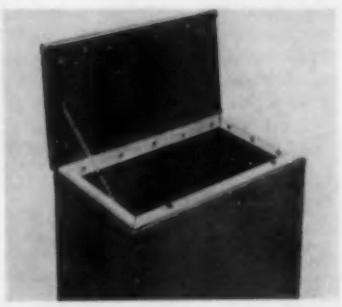
Lodestar "lifts itself with the load."

It is available in capacities from ⅛ to one ton. *Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.*

Circle 48 on postcard for more data

Fiber Boxes

In-plant material handling receptacles made by the Fibre Specialty Div. will be on display, as well as a shipping case for air transportation



of fragile equipment, and a combination truck of light-weight construction. Nesting-stacking boxes will be shown as part of a general line of boxes, trays and roving cans. *National Vulcanized Fibre Co.*

Circle 49 on postcard for more data

(*Please turn the page*)

Light Ramp

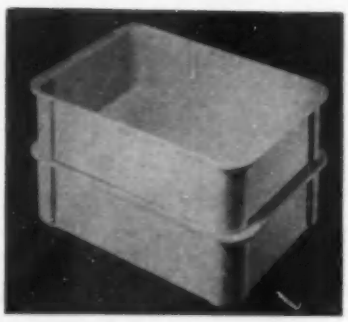
All-magnesium mobile loading ramp, mounted on wheels, makes possible full use of power trucks in loading yard cars. It can be raised or

lowered with its hydraulic lifting mechanism. The firm will show also its line of magnesium dock boards, hand trucks, and a wide range of other magnesium handling equipment. *Magline, Inc.*

Circle 50 on postcard for more data

Stock Boxes

Tray No. 445 in the Toteline of fiberglass tote boxes for small parts handling is 16½ in. long overall, weighs 3½ lb, and has wire-reinforced



top edges. The reinforced corners are designed for stacking when loaded. They are easily cleaned and require no painting in service. *Molded Fiberglass Tray Co.*

Circle 51 on postcard for more data

Mobile Crane

A 15-ton capacity yard-crane on exhibit, model VC-68, is a one-man, rubber-tire mounted, self-propelled utility crane. It features the Speed-o-Matic hydraulic control system of which transparent model will also be shown. The crane has an independent rapid boom hoist, reversing clutches for main drums, independent swing and travel. The gasoline engine operates through a torque converter. *Link-Belt Speeder Corp.*

Circle 52 on postcard for more data

Use Recorder

Efficiency of industrial lift trucks can now be measured by the new model DSR Servis Recorder, being introduced at the show. This device records every load a truck lifts greater than 200 lb. The load to be measured can be varied up to the capacity of the truck by adjusting a Barksdale hydraulic pressure switch which is supplied with the unit. The sealed switch is connected in the line between the control and the lift. The device also shows when and how long trucks are busy and idle. The two sets of facts are etched on wax-type time charts driven by a clock-type mechanism. *The Service Recorder Co.*

Circle 53 on postcard for more data

Magnetic Rolls

Of particular interest will be a working model of small diameter permanent magnetic rolls combined with magnetic sheet fanners built into an automatic sheet feeder.

Magnetically, these small diameter rolls are claimed to be the most powerful ever developed in proportion to their size. Designed primarily for sheet feeding and conveying, they are available in 2½, 4, 4⅜ and 5 in. diameter. *Eriez Mfg. Co.*

Circle 54 on postcard for more data

Tractors

Among new models to be shown will be the TM four-wheel-drive, rear-steering railroad-car switcher with 7-8 tons drawbar pull. Another is the TU-80 four-wheel drive, front-steering, torque-converter drive push-pull tractor with 4 tons drawbar pull. *Frank G. Hough Co.*

Circle 55 on postcard for more data

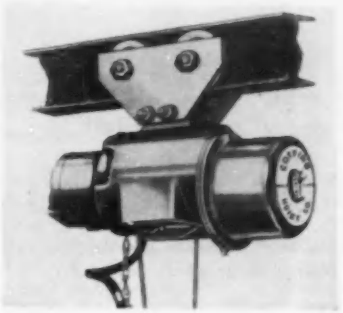
Slings

On display for the first time will be Royal Blue wire rope, 15 per cent stronger than the firm's previous top-grade rope. Other new slings include the tapered sleeve splice sling and the Walles splice sling. *John A. Roebling's Sons Corp.*

Circle 56 on postcard for more data

Hoist Line

Cable Quik-Lift electric hoists are now available in capacity from 500 to 4000 lb, with a choice of lifting speeds and types of suspension. The cable

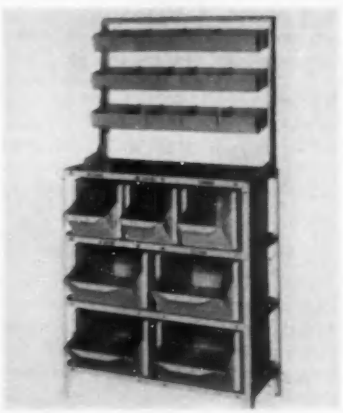


hoists are said to answer the need for a fast, flexible unit on many industrial applications. Features pointed out by the manufacturer are: strength and long life; push-button control; separate load and motor brakes; fool-proof limit switch; and new safety hooks. *Coffing Hoist Div., Duff-Norton Co.*

Circle 57 on postcard for more data

Module Unit

A module unit, for greater flexibility of small parts storage and assembly operations, has been added to a line of small parts handling equip-



ment. The heavy gage welded steel unit measures 14 in. deep, 28 in. long and 30 in. high. Drilled holes in strategic locations permit grouping of stands into various units with connecting shelves. *Bathey Manufacturing Co.*

Circle 58 on postcard for more data

Small Electric Truck

The one-ton Morlift electric stand-up lift truck is an improved version of the model introduced two years ago. Driver is protected by a steel

wrap-around conforming to the ASME safety code. A built-in automatically-controlled charger services the two 12-v batteries from any convient outlet. Controls operate through magnetic contactors. Batteries are mounted on rollers for easy removal. *John Morrell Mfg. Co.*

Circle 59 on postcard for more data

Mobile Racks

Either aluminum or magnesium racks are available for tote boxes, for assembly line work or storage of small parts. They are mounted on

five-in. neoprene casters for easy mobility. They are built as single or multiple units with casters, or as a stationary rack. Single unit dimensions are 70 by 30 by 18½ in. Other models are also offered. *Crescent Metal Products, Inc.*

Circle 60 on postcard for more data

Plant Models

Plant layout equipment for making scale two and three-dimensional models will be on display. Two-dimensional layouts can be made without any drafting, by assembling template outline of machinery, printed on transparent material, onto a grid sheet and making blueprints directly from the master sheet. *F. Ward Harman Associates.*

Circle 61 on postcard for more data

Tow Truck

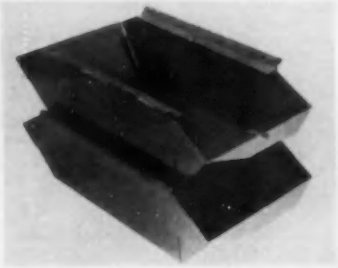
Tow-Bear is a three-wheel electric tow truck operating on automotive-type batteries, for warehouse-type operations. It features automotive-

type components in its construction, and Vickers hydraulic control, Ross steering. Charger is built-in, as is a charger time clock. One model has a battery pull-out rack for ease of 24-hour operation. *Two-Bear Div., Hudson House, Inc.*

Circle 62 on postcard for more data

Parts Container

Metal stack-or-nest boxes for up to ½-ton loads each will be on display. Each box has a hinged lip on two edges, which fold in for stacking or

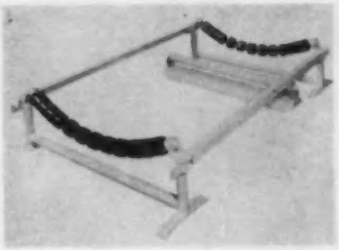


out for nesting. They are six in. high, 12 in. wide and 24 in. long, to fit standard pallet patterns. The end interlocks on pallets for extra rigidity. *Randolph Industrial Equipment Co.*

Circle 63 on postcard for more data

Belt Conveyor Idler

The unique Limberoller is a cable suspension belt conveyor idler that shapes itself to the load. It resists abrasion, corrosion, grease, dust and

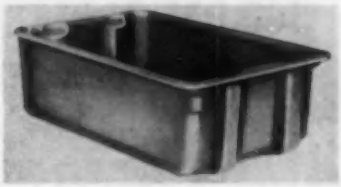


dirt. It is said to be easily assembled and rollers or bearings dismantled without stopping the belt. Pressure-molded neoprene disks are assembled on a neoprene-sheathed steel cable. The disks exert a slight gripping action that is claimed to hold slippage to a minimum and tend to align the belt. *Joy Manufacturing Co.*

Circle 64 on postcard for more data

Two-Way Box

This molded fiberglass tote pan will both stack and nest, because of the unique design of the contoured ends. By alternating ends the boxes stack,



while they nest when the ends are aligned. They are said to release readily whether dry or oily. Size is 18 by 12 by 6 in. Other pans, as well as a rivetless fiber container and wire-wood boxes will be on display. *G. B. Lewis Co.*

Circle 65 on postcard for more data

Pneumatic Tube

A tube system will be operating to show the advantages of high speed tubes with automatic switching. The destination is dialed on the carrier, which moves at 40 fps. Other exhibits will show the firm's line of fork trucks, including LPG-fueled models, and a system of conveyor units. *Lamson Corp.*

Circle 66 on postcard for more data

(Please turn the page)

Handling Box

Expansion of the NesTier line is revealed to include the new and largest model No. 360 materials handling box. The new unit is 36 in. in length,

14 in. high and 16½ in. wide. It has been developed to meet the demand for a materials handling box midway between a tote box and a heavy corrugated bin-type container. These all-welded 14-gage steel boxes tier in rigid stacks when filled, each unit resting securely on the upraised handles or bails of the box below. Contents remain fully visible and accessible. Empty boxes nest. The firm also is showing a shelf rack adaptable for use in stock room, production and assembly, and a roll-over hopper for supplying the worker with parts from kegs or boxes. *Chas. Wm. Doepke Mfg. Co., Inc.*

Circle 67 on postcard for more data

Special Elevators

Standard and special hydraulic lifting devices to be shown include details of an aircraft scale used to plot changes in center of gravity and to weigh airplanes and missiles. Four Levelator lifts form an integral part of the device. The company specializes in hydraulically operated passenger, freight and special elevators. *Rotary Lift Co.*

Circle 68 on postcard for more data

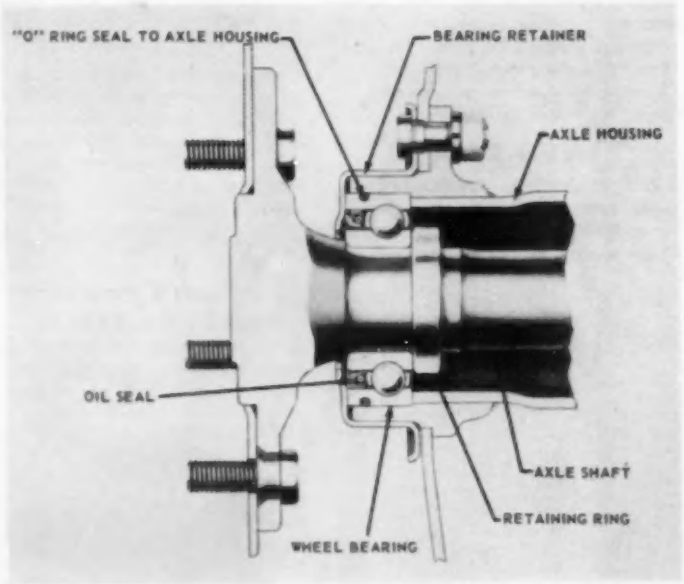
Overhead Conveyor

A complete 120-ft-long conveyor system will demonstrate flexibility and installation simplicity. All turns including 90-deg vertical to 10-deg horizontal are made without idler sprockets with 16-in. radius heat treated fabricated curves. It will show how combinations of turns are made by joining horizontal curves with vertical top and bottom curves. Track is 1⅝-in. cold formed open seam tubing. *Chainveyor Corp.*

Circle 69 on postcard for more data

• • •

REAR AXLE GREASE SEAL *Located in Wheel Bearings*



AMONG the latest new applications of New Departure ball bearings is the single row type located in the rear wheels of the 1955 Chevrolet, a bearing that carries all the wheel loads in any direction.

The wheel mounting has only one seal situated within the precision rings of the bearing. Placing the seal in the bearing where there is perfect concentricity and optimum finish on the sealing surfaces provides maximum seal efficiency. Furthermore, any possibility of damaging the seal when the shaft is inserted in the housing has been eliminated.

A simple "O" ring in a groove in the outer ring completes the closure. Thus, rear end lubricant is effectively sealed in the axle housing where it belongs. The gear lubricant provides adequate lubrication for the bearing and seal.

Installation of this New Departure bearing, produced at the GM Division's Sandusky, Ohio, plant, results in economies by eliminating unnecessary seals, machining of surfaces and handling. Servicing is also enhanced by simple removal of the axle shaft.

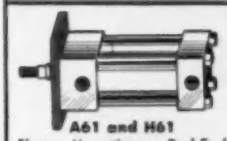
7722 Different Cylinder SELECTIONS—

Miller AIR AND HYDRAULIC CYLINDERS AND BOOSTERS "IN STOCK" for immediate delivery...

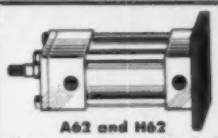
See Miller Bulletins A-105K (Air) and H-104K (Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

"IN-STOCK" MODELS

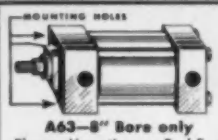
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown in Rod On Drawings.



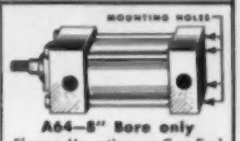
A61 and H61
Flange Mounting on Rod End



A62 and H62
Flange Mounting on Cap End

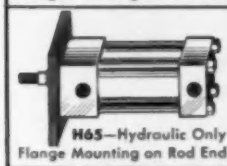


A63—8" Bore only
Flange Mounting on Rod End

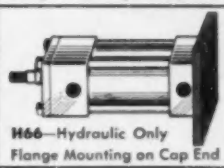


A64—8" Bore only
Flange Mounting on Cap End

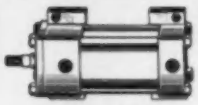
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



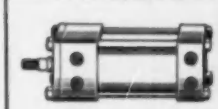
H65—Hydraulic Only
Flange Mounting on Rod End



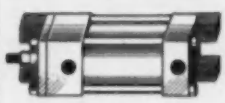
H66—Hydraulic Only
Flange Mounting on Cap End



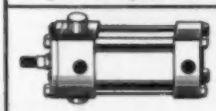
A72 and H72
Side Lug Mounting



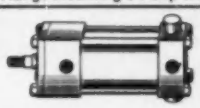
A74 and H74
Side Flush Mounting



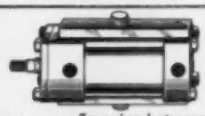
A77 and H77
Side or Foot Mounting



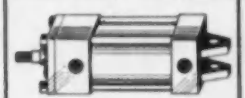
A81 and H81 Trunnion Mounting on Rod End



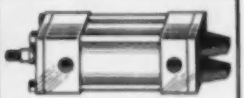
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES in Inches

	BORES	ROD DIA.	ROD TURN DOWN & THREADS	"IN-STOCK" STROKES (in Inches)
AIR	1½	⅝"	7/16-20	Cushioned
				Non-Cush. 1 2 3 4 5 6
	2	⅝"	7/16-20	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	⅝"	7/16-20	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1"	¾-16	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1"	¾-16	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	1"	¾-16	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	6	1⅜"	1-14	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	8	1⅜"	1-14	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12
	2	1"	¾-16	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	1"	¾-16	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1⅜"	1-14	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1¾"	1¼-12	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	2"	1½-12	Cushioned 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush. 1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36

① "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

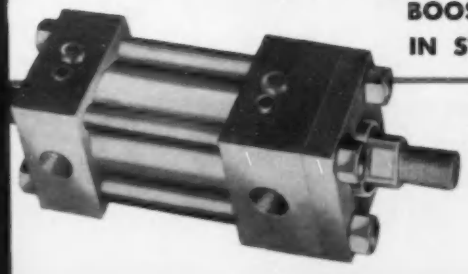
Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.

BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBAB, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.



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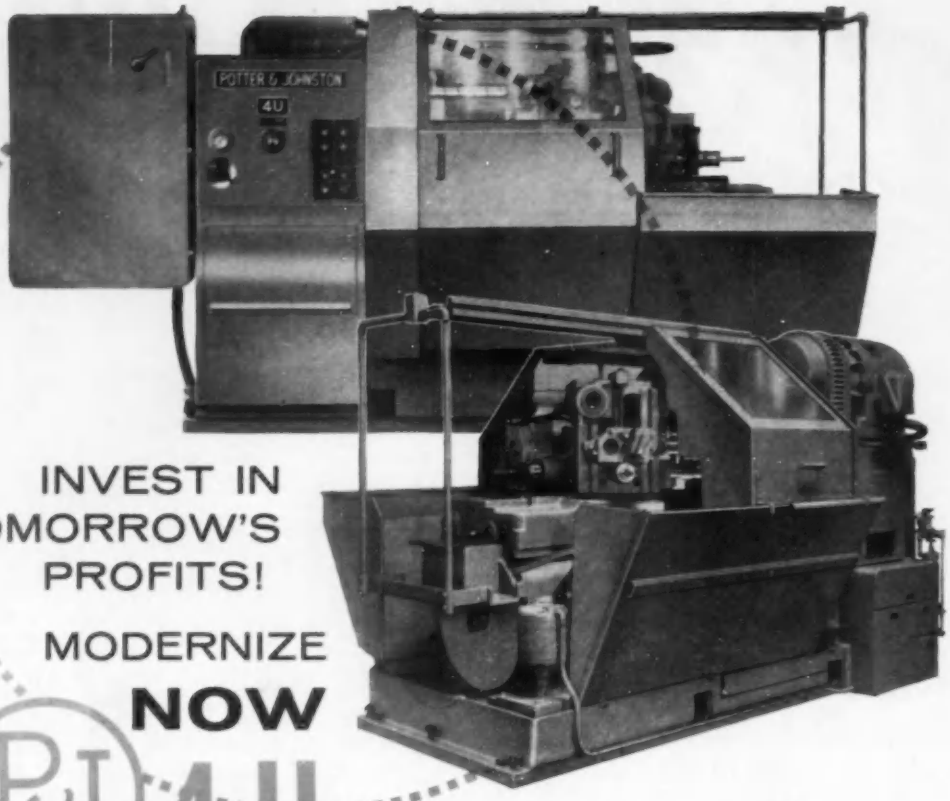
COUNTERBALANCE CYLINDERS



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THE P&J 4-U AUTOMATIC TURRET LATHE

The Potter & Johnston 4-U Automatic Turret Lathe is designed and built SPECIFICALLY to handle today's tough alloys faster and more economically.

Check THESE 4-U PRODUCTION FEATURES

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- **GREATER RIGIDITY** . . . to maintain high precision and eliminate tool chatter under the heaviest cutting conditions.
- **UNUSUAL VERSATILITY** . . . independent front and rear cross slides, overhead pilot for added tool capacity, and many other features . . . plus expertly engineered P&J Tooling . . . means greater profits for a wide variety of work types and sizes.
- **FAST, SIMPLE SET-UP** . . . because *all* machine functions are controlled from a conveniently located, extra large dog drum.

POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
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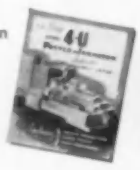
LET P&J SHOW YOU THE WAY

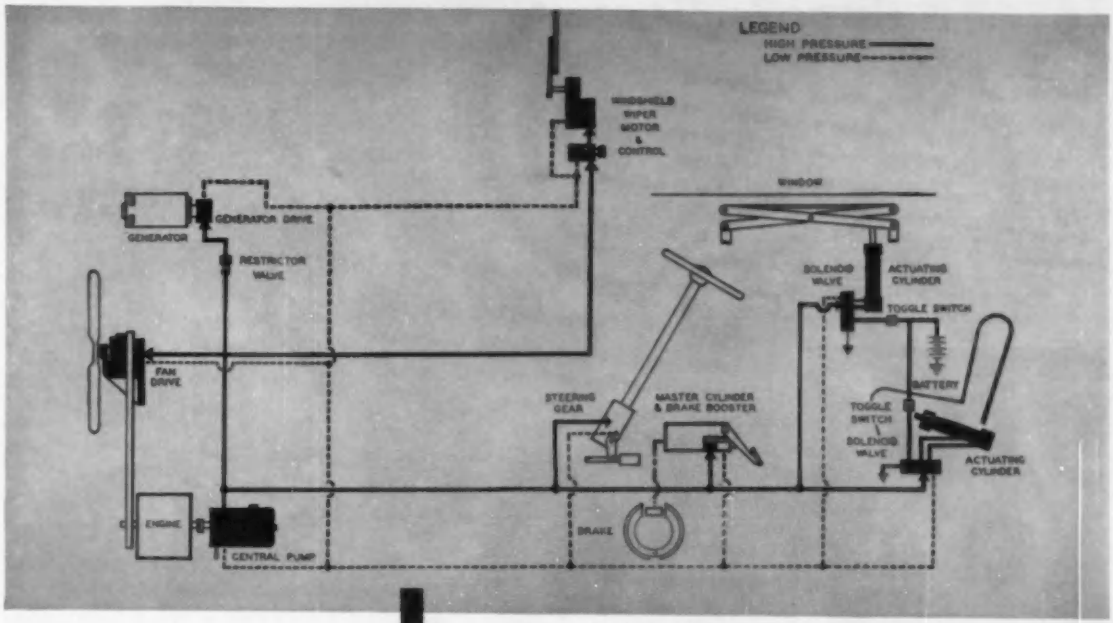
Send now for complete information on the 4-U and other P&J Automatics



SEE US AT BOOTH 1219

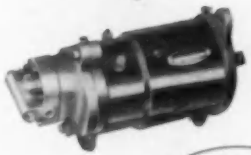
PRECISION PRODUCTION TOOLING P&J FOR MORE THAN FIFTY YEARS

automotive central hydraulic system...



Power source is engine-driven, vane-type Pesco Hydraulic Pump with variable volume output controlled by system demands. System pressure is constant.

Thermostatically controlled Hydraulic Fan Drive uses "on-off" operation for fast engine warm-up and power savings.



Pesco Hydraulic Motor drives generator at constant speed permitting lower capacity, less costly generating system.

unique development uses one pump for all hydraulic requirements

Now, from Pesco comes an Automotive Central Hydraulic System to provide all hydraulic power requirements from a single pump source. This innovation eliminates use of multiple pumps, produces horsepower savings and permits use of a lower capacity electrical generating system.

The diagram shows that Pesco's simplified system provides dependable power-on-demand for operating fan, generator, steering mechanism, brake booster, windshield wipers, windows and seats. All or any part of the system may be incorporated to meet specific power requirements on passenger cars, trucks, off-the-road equipment and materials handling equipment.

Engineered and produced by Pesco, the Central Hydraulic System promises better operation and easier control of tomorrow's automotive equipment.

Sample units of the various components are available to the automotive industry for testing and can be supplied within a reasonable time. Pesco will provide full assistance in applying its system to your equipment. For detailed information, write: PESCO, 24700 North Miles Rd., Bedford, O.

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5 ways

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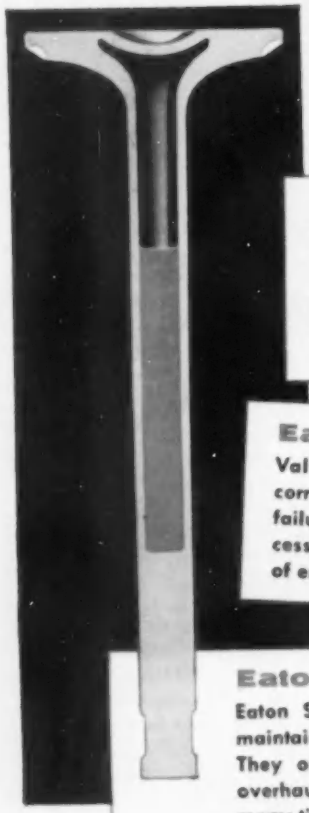
Eatonite — heat resistant, corrosion resistant, wear resistant—applied to valves by a special Eaton-developed process, adds materially to valve life. Available on solid valves, hollow sodium-cooled valves, or free-valves.

Eaton Hydraulic Valve Lifters

Eaton Zero-Lash Hydraulic Valve Lifters maintain zero valve clearance under all operating conditions; improve valve seating; prevent valves pounding into seats. Available in all types and materials.

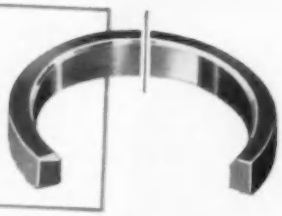


Eaton Free-Valves

Freedom to turn in either direction prevents formation of stem and seat deposits; no sticking or scuffing; no burning or guttering. Eaton Free-Valves can be applied to engines of all types without costly design changes.

Eatonite Valve Seat Inserts

Valve seat inserts of Eatonite—heat resistant, corrosion resistant, wear resistant—reduce valve failure caused by prolonged operation at excessive temperatures and maintain a high level of engine output. Available for all types of engines.



Eaton Sodium-Cooled Valves

Eaton Sodium-Cooled Valves run cooler, last longer, maintain a high level of engine output and economy. They ordinarily require no attention between engine overhauls; keep trucks on the job; pay for themselves many times over.

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As vital parts of tractors, dirt movers and other heavy-duty equipment, these big bolts can take a terrific beating and still hold fast. They will resist shear, fatigue and impact that no common bolts could withstand without wear or breakage. Special heat-treatment produces this unusual toughness, making these National bolts capable of enduring extremely severe stresses.

By cold heading and special production methods, National can turn out many special headed-and-threaded fasteners which, like these bolts, solve special problems or reduce costs. Depend on National's extensive manufacturing facilities and complete line of fasteners for your needs.

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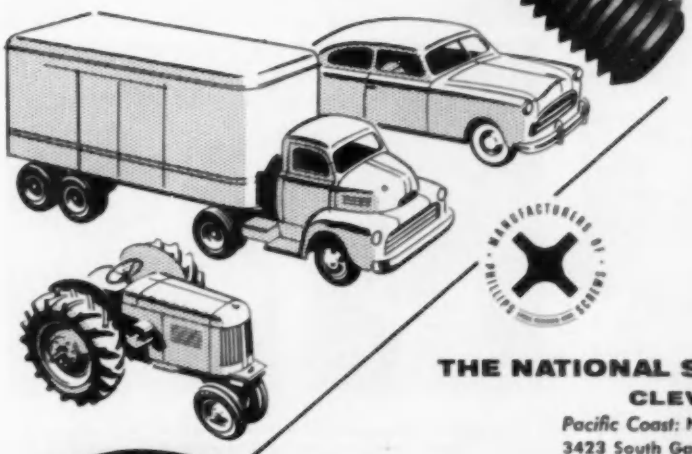

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National PRODUCTS

Fasteners Hodell Chains Chester Hoists

Farval helps flying shear line cut steel processing costs

FARVAL—
Studies in Centralized Lubrication
No. 170

THESE action pictures show a Farval-lubricated Slitting and Shearing Line at work in a well-known steel plant, saving *plenty* for steel users. A short cut for converting steel from coil to production size, it cuts to tolerances at the rate of 100 times per minute. By eliminating costly extras in steel preparation, it cuts costs substantially.

No Lost Time for Lubrication

Naturally—dependable, positive lubrication is essential to the Line's successful operation. That's where Farval comes into the picture. A manually operated Farval Centralized System lubricates 41 vital points safely and surely, while the equipment is in motion, if desired. There's no lost time for lubrication, saving important production and labor costs.

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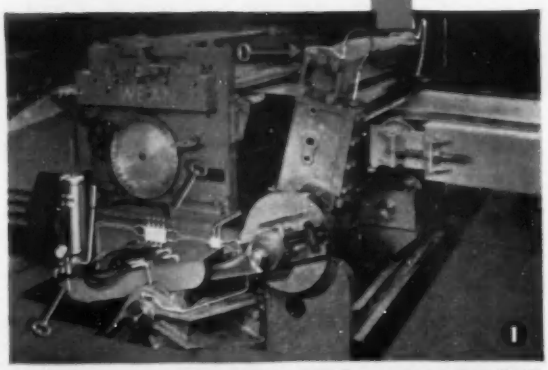
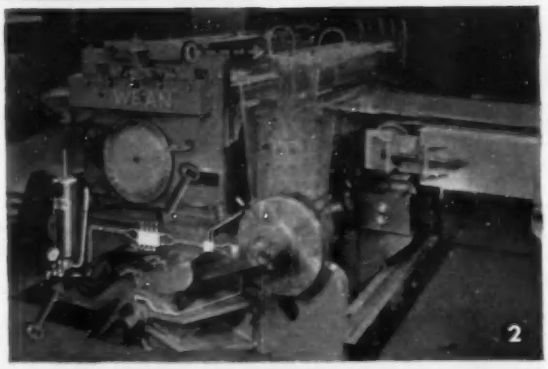
Farval Centralized Lubrication is a simple, reliable system that lubricates bearings quickly, *without* shutdown, from one central pumping station. It delivers oil or grease unfailingly, in the exact amount required whenever needed. Equipment is protected, manhours and lubricant are saved, "guesswork lubrication" is eliminated, steady production is maintained. Automatic or manual Farval Systems can be installed on old or new equipment. Thousands are in use, saving time and money in practically all industries.

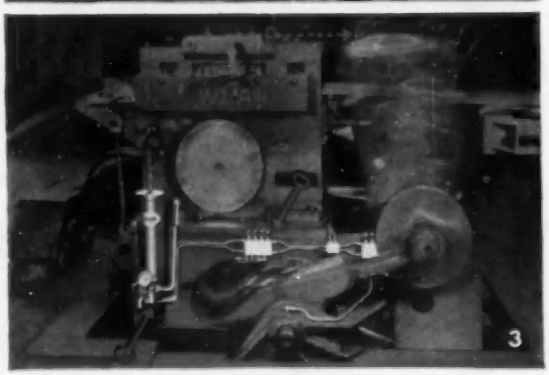
Get Free Bulletin

Farval representatives in all major industrial centers are ready to serve you. There's one near you. Write for free Bulletin 26 that tells you all about Farval, shows how Farval Centralized Lubrication pays for itself many times over. The Farval Corporation, 3296 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.







Ween Equipment Corporation Slitting and Flying Shear Line. Photo 1 shows machine in stationary position. Photos 2 and 3 taken while machine operating. Note intense vibration which the rugged Farval lines withstand.

KEYS TO ADEQUATE LUBRICATION — Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.

News of the MACHINERY INDUSTRIES

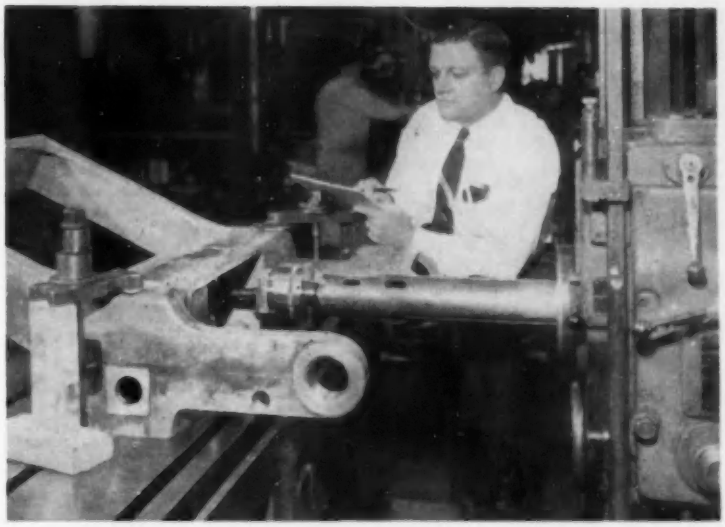
By Thomas Mac New

An Expert Discusses Advantages and Disadvantages of Plans for Leasing of Industrial Trucks as Compared to Outright Purchase

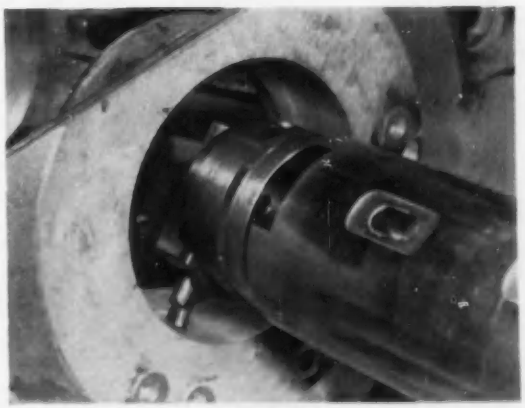
Boring to Tenths

Case histories of machinery and related equipment are always of interest to production people. One of the most recent brought to our attention dealt with boring operations on aluminum castings for radar units being built by Sterling Engine Co., Buffalo. The problem was that the bored holes had to be held to a plus 0.0002 in. tolerance. To solve the problem, the company installed a Deka-Bore offset boring head, made by Precision Tool & Manufacturing Co., Cicero, Ill., on a Giddings & Lewis Type 350T horizontal boring mill in an air conditioned room.

The factory manager, E. J. Reichelderfer, states that after 200 hours of using the head they have found that the 0.0002 in. tolerance has been held without difficulty on diameters from 0.5 in. to five in. in aluminum. Two means of adjustment are used to control the tool bit. A conventional micrometer screw activates the dovetail slide in increments of 0.001, while a new type dial permits positive diameter adjustment of 0.0001 in.



Sterling Engine Co. uses a Deka-Bore on a G&L horizontal boring mill to maintain 0.0002 in. tolerance in aluminum radar castings.



Close - up of the Deka - Bore head boring a five-in. diam. hole in an aluminum casting at Sterling.

Industrial Trucks— Lease or Purchase?

There has been a great deal of discussion in recent months among the users and makers of industrial trucks on the subject of leasing versus purchasing the equipment. The treasurer of Elwell-Parker Electric Co., William H. Campbell, giving the manufacturer's side of the story states that most of the truck producers are rather neutral on the subject. Their business is to sell industrial trucks, and the financing arrangements are of a secondary nature.

On the tax situation, however, Mr. Campbell states that it is the opinion of Elwell-Parker that rental payments on a straight lease with an option to renew at a reasonable rate, but without an option to purchase, can probably be treated as expense deductions for income tax purposes. If the option to purchase at fair market value clause is added, rental payments probably can still be deducted as an expense, but this is less certain.

In any event, there have been, so far as Elwell-Parker is able to ascertain, no specific rulings by the Federal Bureau of Internal Revenue on the aforementioned points for industrial trucks.

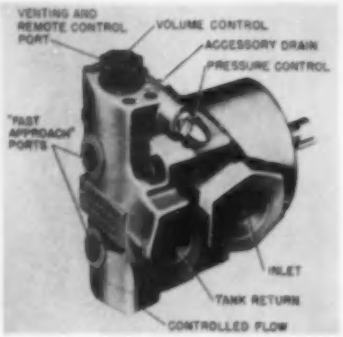
Leasing is not a means of avoiding taxes, but is attractive from the standpoint of tax deduction timing, according to Mr. Campbell. Whether a company buys or leases equipment, the sum total of the taxes paid is practically the same. But, a lease can be written off over its terms, usually three years, whereas a purchased truck would be depreciated over a

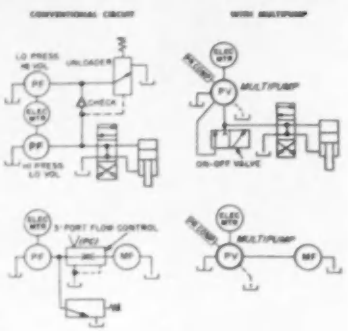
(Turn to page 134, please)

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 101

Variable Volume Vane Pump Easily Controlled





With the Multipump, volumetric efficiency is said to be consistently high. Double sealing edges keep internal slippage low. Inner and outer ends of the vane are exposed to identical pressures. Pumping action of the vanes in the rotor slots, simulating the operation of radial piston pumps, adds to the over-all volumetric efficiency.

THE Multipump, versatile variable vane pump, features fingertip control to deliver variable volume at constant speed or constant volume at variable speed.

Advantages for machinery or vehicular applications are listed by the maker. They include a volume control which works independently of the compensator. The compensator itself works at all volumes. Three models with capacities of five, 15 and 25 gpm at 1200 rpm hold the output volume to within five per cent throughout the desired pressure and speed ranges. Maximum operating pressure is 1000 psi continuous duty. Each model is available in three ratios of maximum to minimum speed, 2:1, 3:1, and 4:1. A "fast approach" port is provided on all models.

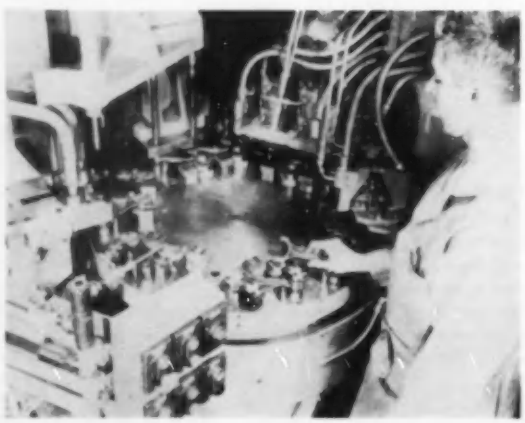
Excess volume is delivered to the tank at low pressure. When operating with flow controlled, the working pressure of the pump is equal only to that required to do the work, not the compensator setting. Delivered volume, once set, remains constant regardless of changes in pump speed or internal slippage.

Less cooling is needed in the hydraulic system. As pump delivery is reduced, horsepower input is reduced. In addition, at all times there is a cooling flow circulated through the pump so that the pump operates at reservoir temperatures. The power from a single variable speed engine may be utilized to provide constant speed accessory drives. Need for separate engine and drive equipment is eliminated. *Denison Engineering Co.*

Circle 70 on postcard for more data

Bushing Assembler

THIS vertical hydraulic machine with automatic cycle assembles bushing into the wrist pin hole of an automotive connecting rod; burnishes the bushing, center drills one wall of the wrist pin bore and then drills an oil hole through. The unit was developed and built around a three-way type machine column, arranged with a six station index table. Mounted on the table are six 2-station fixtures which each hold two parts. The operator loads and unloads parts at the front as the fixtures index past the station. The assembly, burnishing and two drilling units are arranged around the periphery of the indexing table.



American vertical machine for assembling bushings to wrist pins.

At the assembly station a hopper feeds the split bushings to a slide which automatically moves the bushings into position for assembly. Following assembly of the bushing to the wrist pin bore, the parts are indexed to the burnishing station. Burnishing tools are pushed through, burnishing the I.D. of the bushings. A stripper plate allows the burnishers to return, after which the parts index to the first drilling station. Here one wall of the wrist pin bore is spot-drilled. At the last work station the

oil hole is drilled through the wall and the parts are then indexed to the unloading and loading station. Both drilling stations are equipped with two-station self-contained drilling units, and separate electric motors. *American Broach & Machine Co.*

Circle 71 on postcard for more data

Cams Control Cycling Power Unit

CAM-CONTROLLED automatic feed cycles for precision metalworking operations are provided by a new Cycling Power Feed Unit. This self-contained mechanical unit consists of a slide assembly, feed mechanism, cam drive motor and housing. Any desired tooling set-up may be mounted on the slide by the user. The equipment reportedly is practical for drilling, tapping, boring, reaming, sawing, milling, broaching and other precision work on parts of relatively small size.

Cams for controlling the feed cycle can be made by the user or supplied to order. An infinite variation in feed cycles is possible through the simple medium of changing cams—an operation which can be completed in two or three minutes.

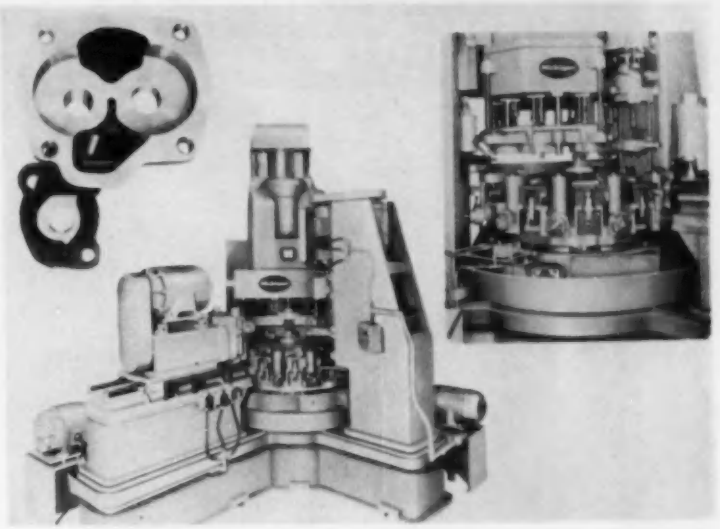
The unit measures 17 in. long, six in. wide and 8⅛ in. high to the top of the motor housing. It can be mounted in a horizontal or vertical plane, or at any angle if desired. Installation is completed by fastening two socket-head cap screws and connecting to 110-v a-c service.

The slide assembly has a working surface of four by six in., and provides a maximum stroke of two in. Accurately machined, it moves on dovetail ways. Gibs with adjusting screws are provided for regulating the clearance and compensating for wear as required.

An efficient gearmotor rotates the cam which regulates the feed cycle of the slide, delivering a torque of 52 in.-lb. Standard cycle times of 4, 6, 8, 10, 12 and 16 seconds per revolution are available. *Russell T. Gilman, Inc.*

Circle 72 on postcard for more data

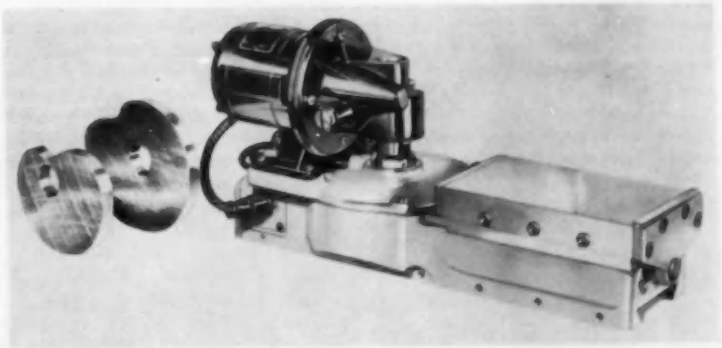
Two Automatic Machines Finish Pump Bodies



The Michigan Drill Head machines are built to JIC standards

Two fully automatic machines have been teamed together to completely finish 120 cast iron oil pump bodies per hour. They are built around standard multiple drilling machines and index tables. The gear pocket end is completely machined and used for locating, so that the part does not have to be released and other locating spots are not required. Machine No. 1 rough and finish mills the top face, drills and taps four mounting holes, precision drills and chamfers two sizes of holes, rough and finish bores, reams and squares the bottom of two gear pockets. Machine No. 2 straddle mills the inside and outside lower faces, finish mills the outside lower face, precision drills and reams two holes and drills three other holes. Bodies are then ready for final assembly. *Michigan Drill Head Co.*

Circle 73 on postcard for more data



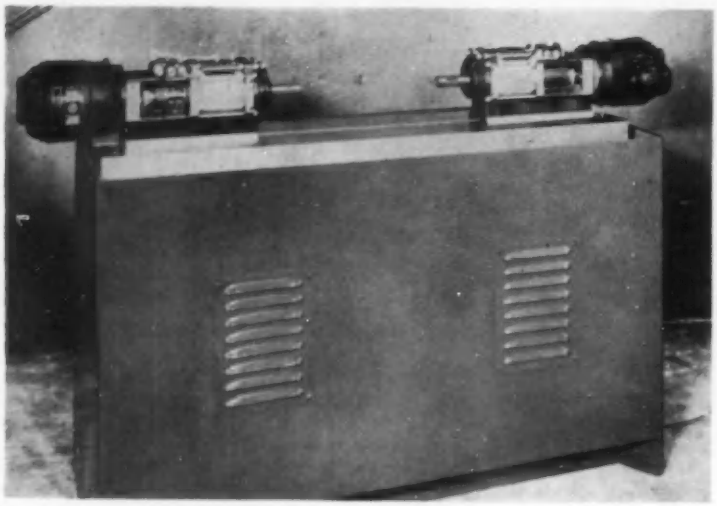
Cam-controlled power feed unit is latest addition to the Gilman line of standard components for special machine tools.

Selective Pushbutton

A FULL stroke "Select-O-Push" operator teams up with a double-pole contact block to make one compact unit to replace the two previously single-pole double-throw units required in many applications. The circuit to be energized is selected by dialing the operator head left or right. The circuit is closed when the pushbutton is depressed. Simultaneous closing of both sets of contacts is impossible. This new selective pushbutton is intended for use wherever space is at a premium. *Westinghouse Electric Corp.*

Circle 74 on postcard for more data

NEW EQUIPMENT PLANT · PRODUCTION



Parts with holes from ½ in. to 24 in. apart can be machined on a double end base for automated setups

Component for Special Machines

THE M23C-1 double end machine base, shown with two Holomatic drill units mounted, was designed to simplify the building of automation-type special machines for drilling and/or tapping opposed holes.

Special tooling set-ups incorporating two units with standard hand or air operated clamps, index tables, shuttle tables, trunnion fixtures or multiple spindle heads can easily be adapted to the base. Centering-type operations are simple to set up. The cast semi-steel top is 12 in. wide, 60 in. long and four in. thick and has a precision ground top. A one-in. keyway is provided the full length of the top for alignment of fixtures and machine components.

Four leveling assemblies are incorporated for leveling the top to the base and an additional four are provided for leveling the base to the floor. The bottom of a large chip collection area is tapered to a screened outlet for coolant drainage. An opening in the rear of the base is provided for internal mounting of a standard removable type coolant pump-reservoir system. *Hause Engineering*

Circle 75 on postcard for more data

Powered Index Table

POWER-driven automatic index tables, available in 21 and 34 in. table diameters with six, eight or 12 stations, are operated by a Geneva drive. A needle-bearing cam follower operates in ways faced with hardened and ground tool steel wearing plates. The hardened and ground tool steel lock pin, actuated by a cam plate, enters the ways before the cam follower leaves them so that it cannot be free-wheeled.

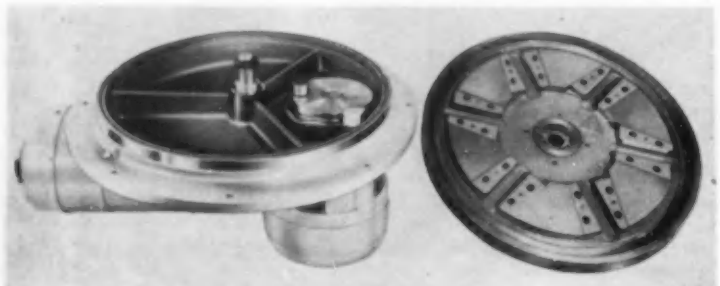
The lock pin projects through the under side of the table housing and its up-and-down movement opens and closes a limit switch which controls the current supply to the machine on which the table is installed.

The table is driven by a 220-440 v, three phase, 60-c 1800-rpm brake motor through a bronze worm and gear reduction unit. The table revolves on a large double-row precision ball thrust bearing and the drive shaft from the reduction unit operates in precision ball bearings while the locking pin travels in hardened steel guides. All shafts are pressure lubricated and all working parts are protected against damage by coolant or chips.

Tables are equipped with locators for interchangeable top plates and can be furnished with an adaptor which permits horizontal mounting for use as the drive for an indexing drum.

The 21-in. model is driven by a ¾-hp motor and has a load capacity of 400 lb with an indexing cycle of 1.5 seconds under normal operating conditions. It may be equipped with top plates up to 32 in. in diameter and, with a work cycle of three seconds, is capable of 800 operations an hour.

The 34-in. table, driven by a one-hp motor, will carry an 800-lb load with an indexing cycle of two seconds under normal operating conditions. It may be equipped with top plates up to 48 in. in diameter and, with a work cycle of four seconds, is capable of 600 operations an hour. Load capacity of either model may be in-



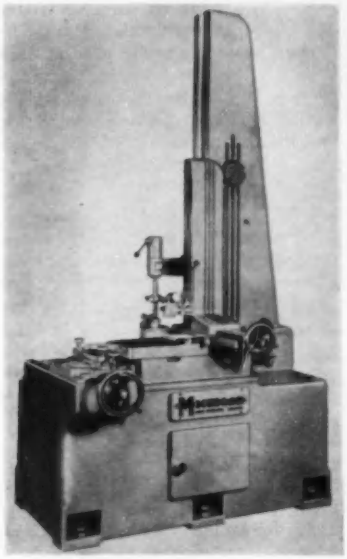
Disassembled view of Cleveland index table

creased by increasing the indexing cycle in direct ratio. *Cleveland Tapping Machine Co.*

Circle 76 on postcard for more data

Involute Checker

MODEL 1124-P Sine-Line involute gear checker will check involute contours and tooth spacing of gears ranging from zero to 24 in. in diameter on shafts up to 60 in. long. Utilizing the sine-bar principle to develop the tracing motion for indicating true involute, only one master disk is needed to obtain the proper ratio between the master disk and the base diameter of the gear being checked.



Michigan Sine-Line involute gear checker.

This is true for checking involutes on gears of any diametral pitch within the capacity of the machine.

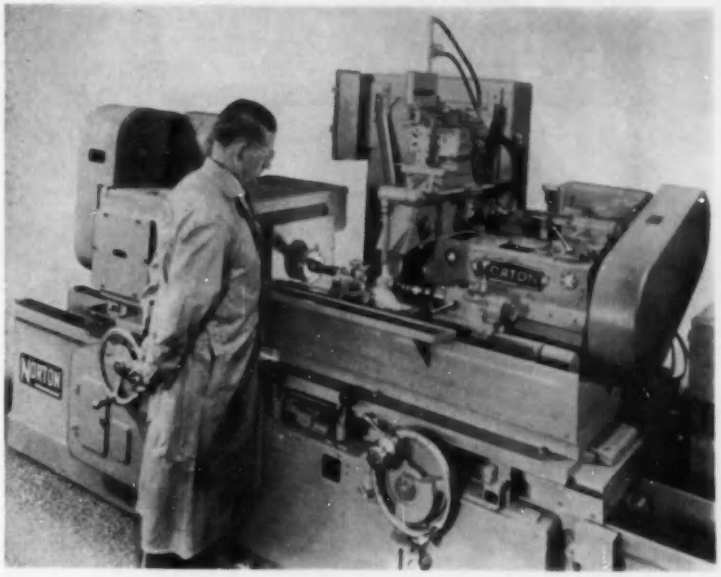
Only two adjustments for setups are required: the sine-bar is set to the correct corresponding angular position as given by standard formulii or tables, and the indicator contact finger is set on the new base diameter.

A removable bracket attached to the indicator head holds fingers for checking tooth spacing. Both spur and helical gears can be checked on Model 1124-P while mounted on solid or tubular shafts. Checking of helical gears is accomplished in either normal or transverse plane. When using the tooth spacing attachment to check teeth in sequence, the indicator is retracted toward the operator and the gear is indexed to the next tooth.

A simple accessory permits checking internal gears in the same manner as external gears. Involute and tooth spacing on long splined shafts are readily checked on the 1124-P. A pneumatic tailstock that facilitates handling large gear and shaft assemblies is available as an accessory. *Michigan Tool Co.*

Circle 77 on postcard for more data

Positive Drive on Cam Grinder



Cam-O-Matic No. 3 automatic cam grinder

AN improved precision cam grinder known as the No. 3 Cam-O-Matic automatic cam grinder has been announced. It is designed for faster grinding of automotive type camshafts with better finish, and features simpler and sturdier construction details.

The positive work drive consist of a Gilmer timing belt which produces smooth work rotation by eliminating slippage and at the same time requires less power.

Two automatically controlled workspeeds are standard. The higher speed is adjusted for optimum rate of stock removal. The slow speed is the ideal rate for the best accuracy of contour and fine finish. The change from the fast to the slow speed is automatic and its timing can be easily adjusted.

The grinding action has been improved through the use of a heavier one-piece rocking bar substantially increased cross sectional area. A tapered roller bearing supports it.

An automatic wheel guard truing cycle commences after the last cam or eccentric has been ground, regardless of the angle of the wheel slide. Since the truing mechanism is built into the wheel guard, there is no swiveling of the wheel head prior to truing when grinding tapered cams. Automatic compensation for wheel wear is built in. Other improvements include simplified electric and hydraulic controls. *Norton Co.*

Circle 78 on postcard for more data

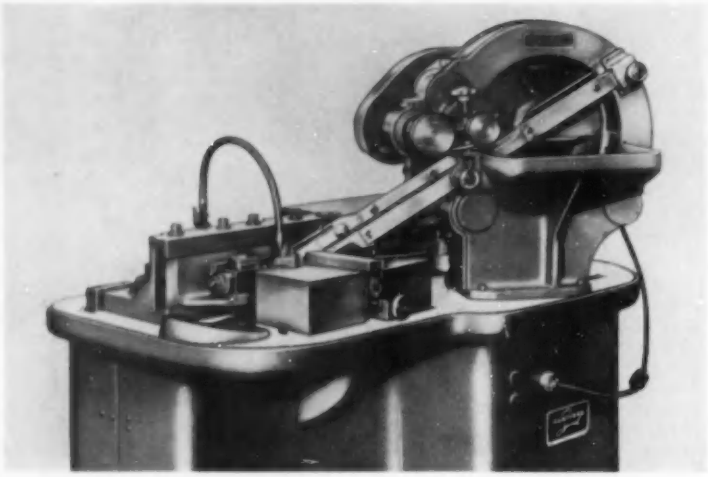
Hydraulic Spring

ANNOUNCEMENT of a so-called Hydra Spring with built-in valve for dampened return to cushion impact has just been made. A low mass piston provides high natural frequencies. Using liquid compressibility, this small, self-contained, dual action unit produces up to 3600 lb force at one in. stroke. It also is available with other spring and dampened return force combination. The liquid unit, called a Comproil, develops up to 3000 per cent the force in the same space as a mechanical spring, delivers maximum force at any position including zero stroke by built-in preloading, and operates at high velocities with low natural frequencies, according to the manufacturer. Dimensions of this particular spring are 4⅝ in. long including one in. stroke, by only 2⅝ in. in diameter. *Hydra Spring Div., Wales Strippit Corp.*

Circle 79 on postcard for more data

NEW EQUIPMENT PLANT • PRODUCTION

New Feed for Thread Rolling Machine



Model A-190-R thread rolling machine with improved hopper feed system.

A REPORTED 75 per cent increase in efficiency in the new model A-190-R thread rolling machines is due to a new feeding system which employs a rotary type hopper. Production rate of the new combined unit is boosted to 230 to 250 pieces per minute.

The rotary hopper has a larger capacity and produces longer runs between refills than does the basic model. Feed rails have been lengthened to accommodate more pieces. This latter feature provides more time for the feed clearing wheel to reject imperfect blanks which clog the feed rail causing "dry runs." In addition, a built-in vibrator assures positive positioning and feeding of blanks, reducing jamming.

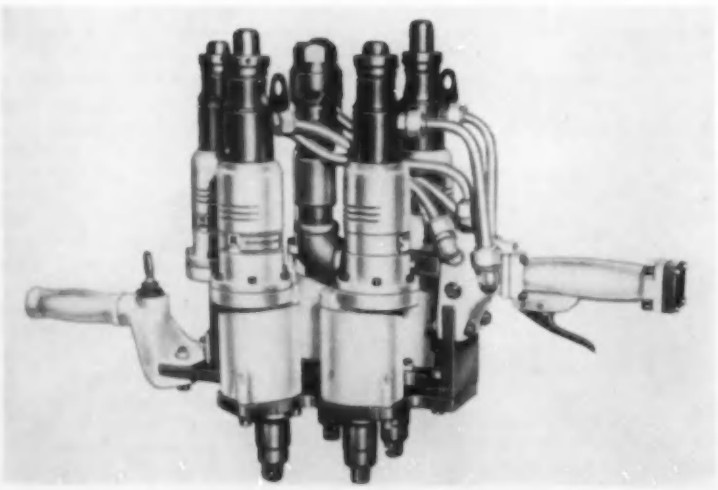
Completely self-contained, the rotary hopper derives power from a 1/12-hp motor which drives the hopper independently permitting variable bucket speeds by changing gears. The hopper bucket is made of cast iron and lifts out for servicing if necessary without disturbing any previous settings. The clearing wheel is mounted on a bracket which swings away from the tracks for easy inspection and replacement.

Other features of the machine are its table top working level and its compactness. Screw diameter capacity runs from Machine Screw Sizes No. 2 (0.086 in.) to No. 10 (0.190 in.). Thread length capacity is ⅛ to 1½ in. with standard depth dies, and two in. with special depth dies. The dies used are the flat type. *Hartford Special Machinery Co.*

Circle 80 on postcard for more data

Multiple Nut Setter

SEVERAL new motor sizes and styles for a line of multiple nut setting tools have just been announced. They are designed to set more closely grouped nuts and bolts than before, and all torque requirements from four ft-lb to 190 ft-lb can be met.



The 28 motor sizes and styles provide a wide selection of speeds and possible mountings.

The nut setter can be used to run from one to 10 or more nuts or bolts simultaneously, and each can be set to the same or a different torque. Each motor spindle has an integral torque regulator that can be adjusted over the entire range of the motor.

The nut setter is designed for ready convertibility through standardization of components. The motor units, handles, manifolds and hose swivel can be re-used when a new set-up is designed. Only the mounting plate and air distribution tubing are changed. The plate, which positions the motor units to the bolt pattern, is of ½ in. steel, and it can be made up as needed. *Keller Tool Div., Gardner-Denver.*

Circle 81 on postcard for more data

Electric Trucks

TWO new machines have recently been added to a family of two- and three-wheeled vehicles. The 730

is a one-passenger vehicle with a two-cu-ft carrier space. It will operate in passageways as narrow as 25 in. The 731 is a two-passenger vehicle, and has a quarter ton carrying capacity in a five-cu-ft carrier space. It has a width of 40 in.

Both electric-powered vehicles feature all-steel bodies set on three-wheel chassis. There is a single steering wheel in front with two differentially operated wheels in the rear. Drive, in the case of the 730, is through a heavy duty wedge belt. Two wedge

Cushman model 731 electric truck.

belts provide the drive in the 731. The 730 and 731 will travel up to 40 miles without recharging.

Both machines have two speeds forward and one reverse; two-wheel mechanical brakes; coil spring suspension on all wheels; heavy duty pneumatic tires; and four heavy duty automotive batteries. The 730 has a 70-in. turning width; a ground clearance of 3½ in.; and a ¾-hp traction type motor. The 731 has a 99-in. turning width; ground clearance of 4½ in.; and 1¼-hp traction type motor. *Cushman Motor Works, Inc.*

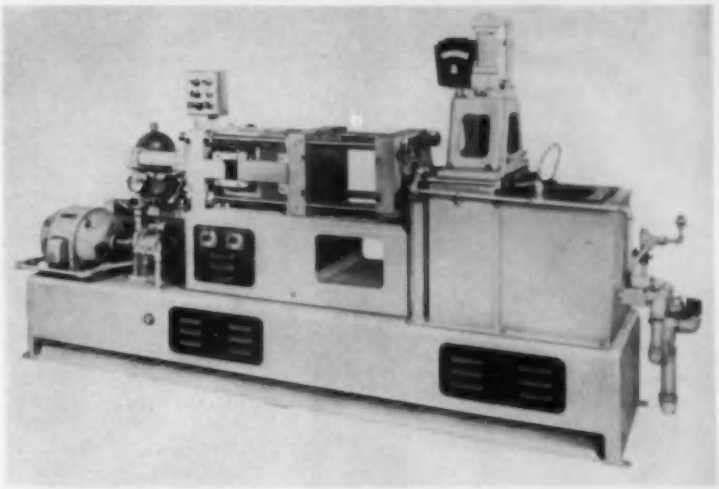
Circle 82 on postcard for more data

Deep Throat Saw

Low cost is an important feature of a 30-in. deep throat contour saw for metals, wood or plastic. The machine is designed to be easily arranged for band filing, metal polishing, finishing and slicing with the 20 attachments which are available. Carbide tools can be ground on this machine. Several models are offered, including those with fixed, stepped or variable speed controls in the range of 50 to 5200 fpm. *DoALL Co.*

Circle 83 on postcard for more data

Low Cost Die Casting Machine



Model 60 HYD plunger gooseneck type hydraulic die casting machine

A low cost, high speed die casting machine will handle shot capacities up to 2½ lb. Design features include all steel welded construction, 80-ton locking pressure, and a 475-lb capacity chrome-contact pot. Automatiç electric cycling provides up to 700 shots per hour. The machine has 17-¾ in. square die platens, with a 6½ in. die stroke. Other components include a blast-type furnace blower, and moving platens supported by bronze carrier shoes. Controls and valves are mounted for easy maintenance and accessibility.

The self contained unit is available in air or hydraulically operated plunger goose neck type for zinc, tin and lead, or cold chamber type for aluminum, brass and magnesium. Either standard or fire-resistant fluids may be used. *American Die Casting Machinery Co.*

Circle 84 on postcard for more data

DoALL deep throat contour saw.

NEW EQUIPMENT PLANT · PRODUCTION

Versatile Plastisol

A unique application of vinyl plastisol material produces a flexible, expansion bellows with extreme variation in wall thickness. It is shown assembled in position on the control

unit of a Bendix automatic pilot. The plastisol material was selected for its superior oil resistance and low temperature flexibility. This unit has withstood flexing tests of more than seven million cycles at room temperature with no visible effects, and flexes easily at temperatures as low as —65 F. The plastisols may be formulated with a wide range of physical characteristics to meet particular requirements. Primary properties are: control of hardness and flexibility; chemical resistance to mineral acids, alkalies, and petroleum products; excellent aging, and good fatigue and wear strength. *Boonton Molding Co.*

Circle 85 on postcard for more data

Body Enamel

Two years of exhaustive testing under every conceivable type of exposure reportedly have shown that a newly announced enamel coating possesses a chalking rate less than one-fourth the rate of the best enamels being used on current automotive production. The new coating, to be known as "D R E" (Dramatically Revolutionary Enamel), is also said to possess exceptional resistance to checking. The coating will not discolor on overbake. Even though an automobile body has been baked three or four times, the color will still match fenders that have been baked only once, thus reducing repaint operations that are often required to correct mismatch due to overbake. Company spokesmen related that the gloss is superior to that of regular body enamels when given a normal single bake. The high lustre is practically unaffected by repeated baking or bakings at high temperatures. The new coating also is said to have unique color-holding properties. *Ditzler Color Div., Pittsburgh Plate Glass Co.*

Circle 86 on postcard for more data

Controls Brazing Flow

A liquid material which will control the surface flow of any known brazing alloy reportedly can be used

effectively with all non-ferrous metals, including titanium and with most alloy steels, including stainless. Called Nicrobraz Green Stop-Off, the liquid permits hairline control in preventing the flow of copper, nickel and silver brazing alloys across the surface of any type of brazed assembly and is applicable to any brazing method. It is of particular value in protecting threads, splines, small orifices, knurled areas and cast surfaces during the brazing operation. The material is recommended for limiting the flow of copper brazing alloys in hydrogen and combusted gas atmospheres and for preventing flow of silver brazing alloys when brazing in controlled atmosphere furnaces or where flux is used. *Wall Colmonoy Corp.*

Circle 87 on postcard for more data

Multi-Purpose Electrode

Inco-Rod "A" is designed to make sound joints between many metals and alloys of different compositions.

Area of greatest usefulness is believed to be in joining of ferritic (mild and low alloy steels) materials to stainless steels or to high nickel alloys such as Monel and Inconel. Field trials are nearly complete, and it is about to go into production. It operates on direct current, reverse polarity. *International Nickel Co.*

Circle 88 on postcard for more data

Embossed Strip Steel

Patterns rolled into cold rolled strip steel in almost any design can be supplied in plain uncoated steel or elec-

trolytically coated with copper, brass, nickel, chrome, zinc or lead alloy in natural, planished and buffed finishes. It can be hot dip coated with lead alloy or tin, and lacquer coated either clear or colored. "Pattern Designed" strip is being produced in widths up to 18 in., and in a range of thicknesses from 0.010 to 0.125 in., depending on the pattern, the type of coating and the finish required. *Pittsburgh Steel Co., Thomas Strip Div.*

Circle 89 on postcard for more data

Improved Inconel Electrode

For welding Inconel to itself, "132" electrode has been improved to eliminate the need for rebaking by the customer in order to get radiographic quality welds. The flux coating is now durable enough to allow baking by the manufacturers, *International Nickel Co.*

Circle 90 on postcard for more data

Synthetic Cutting Fluid

Tool-life in machining titanium metal with a synthetic, water-soluble cutting fluid is reported to increase as much as 300 to 500 per cent as compared to tool-life with heavy-duty solubilized oils, according to experimental results released by the manufacturer. Ucon Cutting Fluid H-640

in a one to five dilution with water gave these results in turning and parting Ti 150 titanium test rings with No. 883 Carboloy carbide tip tools. It forms a clear solution with all proportions of water at room temperature. Its true water-solubility permits excellent visibility of the work being cut, formed, or ground. It can be completely removed with a cold water rinse. The fluid can also be vaporized in heat-treating operations. *Carbide and Carbon Chemicals Co.*

Circle 91 on postcard for more data

Protective Coating

Laqua, a coating for metals that preserves chemically cleaned surfaces obtained directly after electro plating or a chemical cleaning operation, can be sprayed on a clean surface or be applied as a dip after a final water rinse without drying. It displaces water as it deposits a thin protective film. When the product is applied, metals that normally discolor by oxidation, contact with sulphur fumes and humidity, are kept in a bright, clean condition free from fingerprints. Laqua also offers salt spray resistance. After 210 hours of an ASTM salt spray test, no corrosion was found on coated parts. *Fidelity Chemical Products Corp.*

Circle 92 on postcard for more data

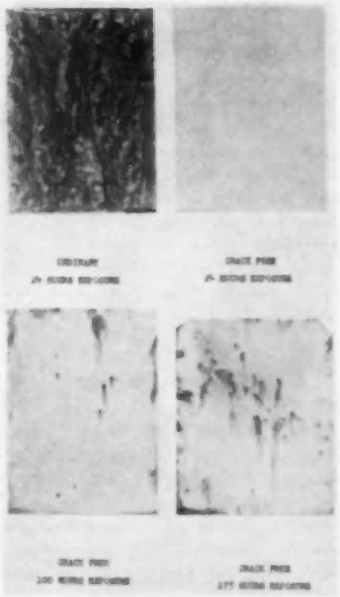
Alloy Arc Welding System

For the welding of chromium-molybdenum alloy steels for high pressure, high temperature applications, a new arc welding system is now offered using a series of premium welding electrodes. Marketed under the trade name "Murex CROLOY," and not previously offered commercially, these low-hydrogen chrome-moly electrodes with closely controlled carbon content are said to have produced outstanding results in actual manufacturing practice. The advantages claimed include: weld cracking is almost completely eliminated; high preheat temperatures normally required when welding these steels can be avoided; they reduce the need for maintaining the preheat after welding and prior to stress relieving; and in many welds they obviate the need for stress relieving, provided applicable codes permit placing such welds in service without post heat treatment. *Metal & Thermit Corp.*

Circle 93 on postcard for more data

Chrome-Only Plating Process

Chromium deposits free from cracks and pores are provided by a process now available commercially. In the so-called Creck-Free Chromium process, chromium is plated directly on steel or other metals, without any underplating. The resulting workpiece has a ductile matte-finish surface which in tests is equal in corrosion resistance to ordinary chromium plating of the same thickness, and better than a plating of chromium only, of the same thickness. The test plates show results of salt spray tests of 0.0003-in. chromium plated directly on steel.



Wear resistance applications and commercial corrosion resistance applications are seen as the initial use for this process. Brightwork applications require buffing, which in itself further improves corrosion resistance. Advantages include freedom from cracks even when a plated piece is heated to 1000 F and plunged into water. Improved non-galling, non-seizing and leveling properties, adhesion, ductility and throwing power have been demonstrated in pilot plant and field operations.

Plating is done with a special bath having automatic regulation of the catalyst concentration. Standard equipment and procedures are used with the firm's Unichrome SRHS compound CF-500 in water. Plating speed is conventional. *United Chromium, Inc.*

Circle 94 on postcard for more data

Synthetic Cutting Compound

Dromus Oil E, when dissolved in water, yields a safe and economical cutting solution for use in all types of machine tools. It is made entirely of synthetic ingredients. The working solution prepared from this liquid is said to have exceptional cooling properties. It may be mixed with a large volume of water, and prevents rusting while improving wetting properties. The product actually dissolves in water, forming a true solution instead of an emulsion. Even on long standing, no separation is noticeable. The solution is stable at all temperatures normally encountered. It will not leave oily or greasy deposits on clothing, will not froth or foam objectionably, or form hard-to-clean sludge. *Shell Oil Co.*

Circle 95 on postcard for more data

Oil Base Coolant

Cimcut Base Additive, a sulphur chlorinated oil additive containing extreme pressure and polar lubricating properties, has been developed. It can be blended in various dilutions with mineral oils. When the sulphur and chlorine separate at extreme pressure and temperature, they form iron sulfides and chlorides of low shear strength for lubrication. *Cimcool Products Div., Cincinnati Milling Machine Co.*

Circle 96 on postcard for more data

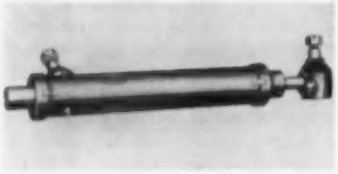
Bimetal

A thermostat bimetal for carburetor controls, including exhaust heat manifolds and carburetor chokes, is composed of Invar (36 per cent nickel-iron alloy) as the low-expansive lamina, and 22 per cent nickel, 3 per cent chromium, 75 per cent iron as the high-expansive component. The metals are directly bonded by temperature and pressure without the use of an intermediate agent. ASC-1 is a general purpose bimetal combining a high deflection rate over a large temperature range with high strength, high electrical resistivity, and a fair degree of corrosion resistance. *American Silver Co.*

Circle 97 on postcard for more data

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 101



Steering Booster for Small Vehicles

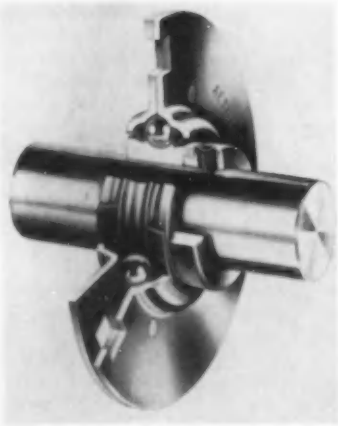
Series S22 low-cost oil-hydraulic power steering booster is designed specifically for materials handling vehicles in the 4000 to 10,000 lb axle loading class; farm machinery of 40 hp and up; busses in the 4000 to 5000 lb axle loading class; city and intercity trucks for 4000 to 6000 lb axle loading; and construction machinery classified for 6000 to 8000 lb axle loading. With double-tube construction, assembly tie rods are replaced with end caps which are screwed on and secured with removable tack-welded clips. The annular space between the double cylinder walls is utilized for booster oil flow. Piston rod and ball stud housing are forged as a unit. *Vickers Inc.*

Circle 37 on postcard for more data

Three-Way Governor Switch

This new governor can be arranged to open or close three separate circuits at three different speeds anywhere between 1200 and 10,000 rpm. Operating mechanism consists of rotating governor flyweights acting upon snap switches. When this unit is used in conjunction with engine or turbine control systems, the three functions of starter disconnect, underspeed and overspeed protection are combined. Model GA-3 is shown arranged for mounting on a standard aircraft AND20005 engine tachometer pad. *Synchro-Start Products, Inc.*

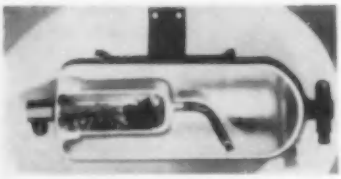
Circle 38 on postcard for more data



Aluminum Floor

A new extruded aluminum floor for refrigerated trucks and trailers features a new type interlocking joint, designed specifically to prevent leakage to the insulation below, while providing for great strength and increased payload. The interlocking joint eliminates need for screw holes through the top surface of the boards for fastening them to cross members. The floor is designed for lift truck loading up to 10,000 lb gross, with strength equal to or greater than that of conventional wood flooring. As each board is installed, a screw flange below the surface is drilled and screwed firmly to cross members. Or, if it is desired to lay the entire floor before fastening, a drill center line is provided, and sufficient metal thickness is retained for countersinking flat-head screws. *Reynolds Metals Co.*

Circle 39 on postcard for more data



Bearing for Sheet Metal Support

While designed primarily for shafts supported by sheet metal members, a self-aligning adapter bearing is a complete, single-package, pre-lubricated unit that is readily adaptable to the numerous applications where loads range up to 200 lb and speeds up to 1000 rpm. The flange of the unit, which is the bearing outer race, can be bolted in place and the shaft slipped through and secured by an eccentric locking collar. *Aetna Ball and Roller Bearing Co.*

Circle 40 on postcard for more data

Liquid Receiver for Air Conditioning

Self-dehydrating liquid receivers for automobile air conditioning systems are announced. These receivers have the hydro-gel dehydrator mounted inside and concentric with the receiver shell. The unit is hydrogen copper brazed. *Tube Manifold Corp.*

Circle 41 on postcard for more data

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

High-Speed Quill 1

A ½-hp power quill for use with carbide tools at up to 45,000 rpm is included in a catalog of various grinder-millers and quills for high-speed uses. Price list included with catalog FGH-2. *Precise Products Corp.*

Welded Tubing 2

Applications, characteristics and properties of its welded steel tubing are well covered in an eight-page folder. *Michigan Steel Tube Products Co.*

Carbides 3

An anti-cratering ingredient is the basic improvement in the CA-600 series of steel-cutting carbides. Four-page application folder C-11. *Allegheny Ludlum Steel Corp.*

Check Temperatures 4

Crayons, pellets and paints that indicate temperature by melting at specified points between 113 F and 2500 F, accurate to ± one per cent of temperature. Folder. *Tempil Corp.*

Diecasting Machine 5

Model 200 diecasting machine, a universal high pressure hydraulic machine for hot or cold aluminum, brass, magnesium, zinc, lead, and tin alloys is described in detail in a four-page folder. *Cleveland Automatic Machine Co.*

Flame Hardening 6

Equipment and applications for flame hardening are collected into one catalog on Flamatic machines, No. M-1861. *Cincinnati Milling Machine Co.*

Gap Presses 7

Details of the GI fabricated steel single point gap presses from 75 to 200 tons are illustrated in a 12-page leaflet. *Minster Machine Co.*

Body Parts 8

Standard truck body and trailer parts are pictured and described in a 143-page catalog. *Binkley Mfg. Co.*

Torque Specs 9

A manual for users of torque wrenches describes various types and discusses torque control specifications and applications. *P. A. Sturtevant Co.*

Nameplates 10

A variety of Metal-Cal aluminum etched nameplates are pictured in a folder now offered. The nameplates are attached with a pressure-sensitive adhesive. *C & H Supply Co.*

Electric Trucks 11

Three electric, stand-up, hydraulic fork lift trucks, series K-46, of 2000, 3000, and 4000-lb capacities are described in folders 5111, 5112 and 5113. *Yale Materials Handling Div., Yale & Towne Mfg. Co.*

(Please turn page)

VOID After July 15, 1955 **5/15/55**

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Turbochargers 12

Photos and curves on turbochargers for large two- and four-cycle engines are available in bulletin 8000. *DeLaval Steam Turbine Co.*

Blowers 13

Rotary blowers for industrial processes, 50 to 4000 cfm up to 14 psig are illustrated in folder No. 225. *Miehle-Dexter Supercharger Div. of Dexter Folder Co.*

Ground Taps 14

New tolerances and limits are given in the latest catalog of ground thread taps, T-583, offered by *Pratt & Whitney Div. of Niles-Bement-Pond Co.*

Testing Machines 15

An eight-page guide to the selection of physical testing machines has just been published by *Riehle Testing Machines, Div. of American Machine and Metals, Inc.*

Nylon Tubing 16

Flexible nylon pressure tubing for air, coolant, fuel, lubricants, etc., is described in a new product bulletin issued by *The Polymer Corp. of Pennsylvania.*

Instrument Line 17

Catalog 5002 is a new issue of the 24-page composite catalog which briefly and concisely describes the firm's industrial instruments and equipment, including the latest developments. *Minneapolis-Honeywell Regulator Co.*

USE THIS POSTCARD

Hydraulic Cylinders 18

Power cylinder bulletin H-104K supersedes and replaces bulletin H-104G and contains complete design, engineering, construction, mounting, dimensional, and operational data on a complete line of heavy duty, 2000-psi high pressure hydraulic cylinders in 1¼ through 12 in. bores, up to 22-ft strokes and 19 different mounting styles. *Miller Fluid Power Co.*

Press Brakes 19

Eight-page folder illustrates and contains specifications on new SEM-CO steel press brakes and forged steel press brake dies. Standard brake dies up to 12 ft may be ordered from the folder. *Service Machine Co., Inc.*

Carbide Blanks 20

A new carbide catalog shows a complete line of blanks, tools and inserts with prices as well as technical information on the proper grade selection. Included in the catalog are several new items including new standard blank sizes and new rectangular strip sizes. *Vascoloy-Ramet Corp.*

Induction Heating 21

Booklet B-6519 describing induction heating equipment for annealing and metal joining is available from the *Westinghouse Electric Corp.*

Airborne Flowmeter 22

An airborne flowmeter, consisting of a small flow sensing element mounted in an aircraft fuel line, a flow rate indicator, and a total flow indicator is fully described in specification sheet AF-1, available from the *Potter Aeronautical Co.*

Parts Trays 23

Eight-page catalog DN-1000, covering all products in the NesTier line of small parts handling equipment, is illustrated with installation photographs and shows how an integrated, plant-wide parts handling system can be custom tailored to individual requirements using standard stocked units. *Chas. Wm. Doepke Mfg. Co.*

Die Block Milling 24

Circular D-1 pictures Rigidmils for miscellaneous die block milling. *Sunstrand Machine Tool Co.*

Machine File 25

The Di-Profiler hand tool that mechanically scrapes, hones, mills, files, polishes, saws, laps, grinds and engraves is shown in a folder which illustrates more than a dozen applications. *Nord International Corp.*

(*Turn to page 147, please*)

VOID After July 15, 1955 **5/15/55**

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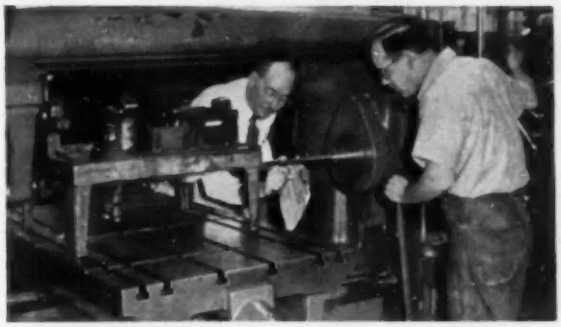

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NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 101

Axial Motor

This nine-piston axial hydraulic motor in two models develops 9.7 and 14.6 hp at 4000 rpm and 3000 psi. Only four bolts hold the assembly together. Designed to MIL-M-7997, the units of 0.348 and 0.510 cu in. displacement provide 163 and 236 in.-lb of torque at peak efficiency of 94 per cent. Overall dimension are 3-in. square by 4⅜ or 5¼ in. long. *United Hydraulics, Inc.*

Circle 42 on postcard for more data

Autopilot

The L-10 flight control system for supersonic aircraft meets latest military requirements with such features as automatic Mach-number control, automatic "G" control, all-altitude maneuverability, automatic heading selection, command maneuvering by control stick as well as conventional controller, continuous sideslip control, and continuous automatic trim control for all control surfaces.

The amplifier of the L-10 is of a new design which provides approximately ten times more usable amplifier gain than the current model F-5. The result is a very "tight" control-surface positioning loop.

Stability augmentation on a full-time basis is another advantage incorporated in the L-10 system. Automatic damping of the lateral and longitudinal control modes is accomplished by the autopilot during periods of manual flight when the autopilot is disengaged. Separate electronic damping systems are not required. The damping action cannot be felt on the controls.

Also cited as an important development is the ability of the L-10 to operate from remote gyro references. *Lear, Inc.*

Circle 43 on postcard for more data

Cooling Package

An electronic equipment heat exchanger package has been designed to permit its installation remote from the packaged controls. The heat exchanger portion of the assembly can be installed in a ram-air duct or the cooled-air duct leading from any refrigeration source. The unit uses OS-45 fluid.

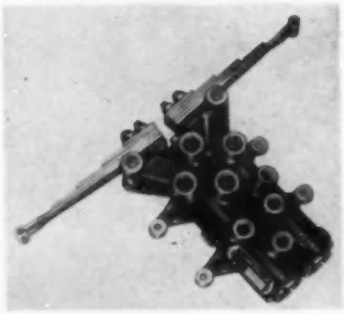
This cooling package is an environmental system. The unit will operate from sea level to 70,000 ft, dissipate 350 watts when available temperature does not exceed 131 F at sea level or 0 F at 70,000 ft.

The unit will consume approximately 60 watts of electrical power and no more than 15 watts of air horse power. From sea level to 70,000 the hydraulic circuit is pressurized to a minimum of two psig at −65 F and a maximum of eight psig at 212 F. A constant gage pressure is maintained regardless of altitude within these specified limits. The electronic equipment therefore is not over-pressurized at any altitude. The cooling packages are designed for ambient temperature operations; cooled air duct or refrigeration installation; the water boil-off system and the hydrous ammonia evaporative system. *United Aircraft Products, Inc.*

Circle 44 on postcard for more data

Two-Way Brake Valve

Development of a combination hydraulic and pneumatic wheel brake valve has been revealed. In a single body there are four separate valves, two for hydraulic pressure to wheel brakes and two for pneumatic operation of the valve. Pneumatic ratings have been raised to 3000 psi. *Gladden Products Corp.*



Circle 45 on postcard for more data

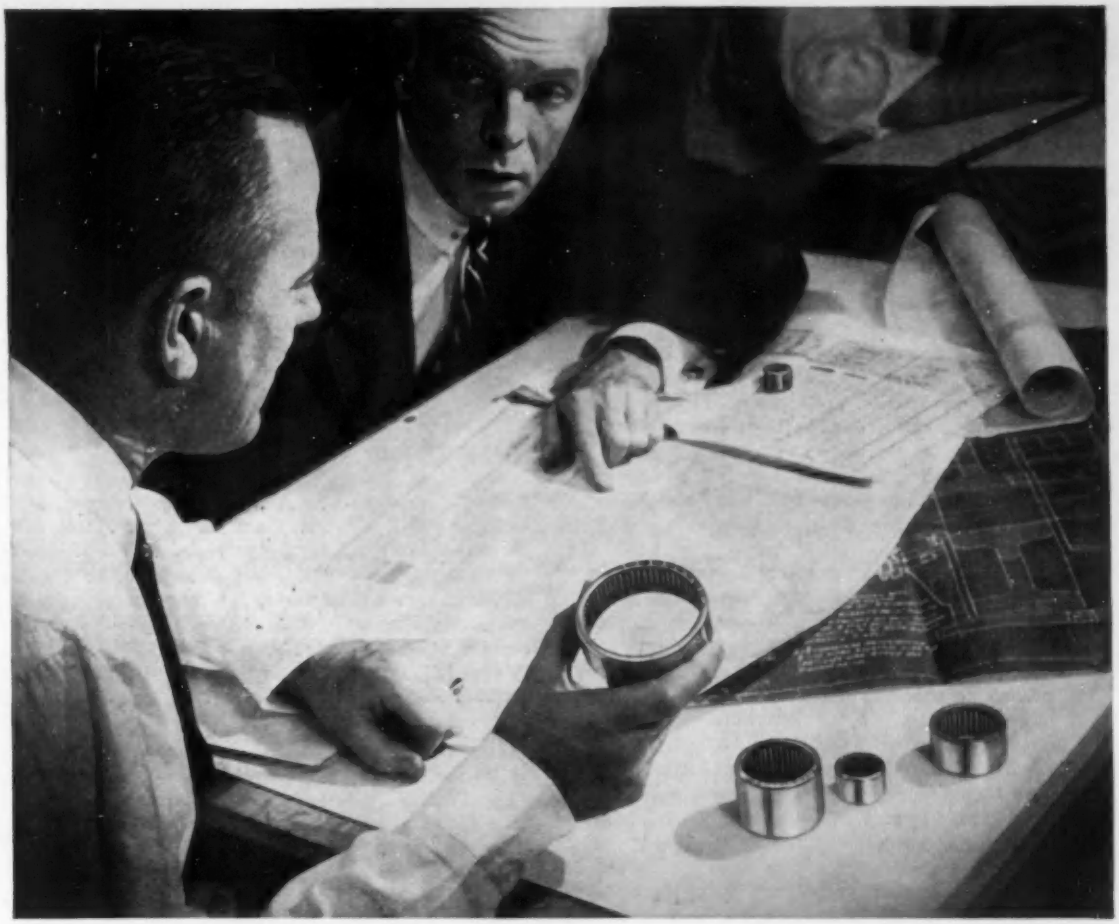
Motorpumps

New motorpumps (electric motor-driven hydraulic pumps) featuring high overall efficiency and low input amperage are being custom made for use as an independent, auxiliary souce of power or as a primary power source in remote areas in aircraft oil-hydraulic systems.

A fixed displacement or automatic pressure compensated variable displacement pump may be specified. Electric motors can be explosion-proof or explosion-resistant, and can be furnished with a radio noise suppressor. Cooling of the hydraulic oil usually is not required.

It is possible to drive the smaller size pumps directly. High efficiency (92 percent overall) of the pump used results in a lower electric power requirement. *Vickers, Inc.*

Circle 100 on postcard for more data



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Endurance Qualities of Reground Ball Bearings

By Raymond J. Lynch, Assistant Chief Engineer
New Departure Div., GMC

IN many present-day mechanisms requiring the use of ball bearings, the design trend is to load bearings very heavily. To meet such requirements without customer dissatisfaction from erratic bearing performance, it is necessary that bearings of uniformly high quality be used. In such cases, the endurance qualities of reground bearings becomes an important factor in deciding whether or not they should be used.

To make this decision, something should be known of the nature of fatigue in bearing materials. It is an accepted fact that fatigue in bearing races starts under the race surface.* Therefore, when considering the endurance qualities of reground bearings, two questions which should be answered are:

1. If a surface fatigue failure occurred in one of the original ball races and was removed by regrinding, is fatigue failure likely to recur in the same spot and after a short period of time when the bearing is again put into service?

2. If subsurface fatigue had developed in a ball race which was then reground, would the surface fatigue failure be apt to occur in much less time than in a new bearing?

To determine answers to these questions, tests were run in the New Departure Physical Test Laboratory. Bearing inner rings having small ball race failures were accumulated from previous tests, were reground to remove surface evidence of fatigue failure and were then assembled into bearings in which all other parts were new. The point of original failure on each inner ring was marked. Two lots of ten bearings each were tested, one under the original heavy load and one under the original moderate load. Test results are given in the two tables.

Test of 10 Reground Bearings under Heavy Loads

Bearings	Average Life (hours)	Minimum Life (hours)	Ball Race Where All Failures Occurred	Number of Bearings Where Failure Recurred in Same Spot	Average Life of Reground Bearings
New	366	123			
Reground	153	4	Reground Race	6	42% of new bearing life

Test of 10 Reground Bearings under Moderate Loads

Bearings	Average Life (hours)	Minimum Life (hours)	Ball Race Where All Failures Occurred	Number of Bearings Where Failure Recurred in Same Spot	Average Life of Reground Bearings
New	1003	1271			
Reground	472	79	Reground Race	2	29½ of new bearing life

Conclusions which can be drawn from the tests provide answers to the two questions which were previously set forth. These conclusions are:

A fatigue failure is likely to recur in the same spot and after a short period of time in bearings in which surface fatigue failures were removed by regrinding. Also, the heavier the load the more likely it is that a fatigue failure will recur in the same spot.

A surface fatigue failure is apt to occur in reground bearings in much less time than in new bearings, even when no surface fatigue areas had developed in the original bearings from which the reground bearings were made. This must be due to subsurface fatigue areas which were not known to exist and which were not removed by regrinding. To regrind ball races to a depth sufficient to ensure removing all fatigued material would be costly and might distort the original bearing proportions to an undersirable degree.

Therefore, if reground bearings are considered for use in mechanisms where even moderate loads are to be encountered, it should be recognized that endurance life will be much less than that of new bearings and probably enough less so that the use of reground bearings cannot be justified on economic grounds.

*Reference: "Metallographic Observations of Ball Bearing Fatigue Phenomena," by A. B. Jones, published in *Proceedings*, Vol. 46, of the American Society for Testing Materials.

• • •

AMA Lends Full Support to Roadbuilding Program

The Administration's proposed $101 billion, 10-year highway program, now being debated in Congress, was given new support last month by the Automobile Manufacturers Association. Its several suggestions will be considered by lawmakers in the coming weeks.

Basically, AMA urges adoption of full modernization of the vital 40,000-mile Interstate Highway System; completion of the plan within 10 years; and use of the accepted business practice of long-term financing. The third precept is among the measures most strongly advocated by AMA.

A major benefit from the program, AMA says, would be an estimated 40 per cent reduction in the annual highway toll of more than 36,000 lives. In addition, AMA states that the program would be a stimulus to the national economic growth necessary to produce an additional $30 billion in Federal revenues in the next 10 years.

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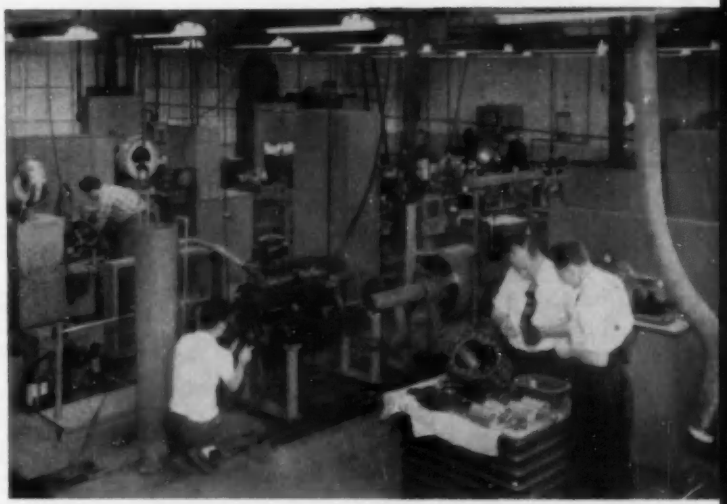

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The BUSINESS PULSE

Over-All Business Activity May Be Sustained at Higher Levels During Second Half of Year Than Was Thought Likely a Few Months Ago. Upward Tendency in Length of Factory Work Week Continues.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Business Uptrend Spreads Out

Recent events have served to strengthen the impressions stated in these columns a month ago. Those impressions were: (1) that the uptrend of business had been much sharper than had generally been anticipated last fall, and (2) that the uptrend showed numerous signs of fanning out. In the latter connection, attention was called to the spilling over of the recovery into a range of industries other than steel, automobiles and construction, and also to favorable reports on intended business investment and plans for consumer spending. These things considered together, it was suggested, encouraged the hope that over-all business activity will be sustained at higher levels during the second half of the year than observers had thought likely a few months ago. Even with the prospect of a decline in automobile production during the latter part of the year, it appeared that momentum alone gave reasonable assurance of a good second half.

Business reports of the past month provide confirmation both that business had attained surprising vigor by the end of the first quarter and that it was diversified in character.

High Industrial Production

In March the Federal Reserve Board's seasonally adjusted index of industrial production rose to 135 per cent of its 1947-49 average, only two points below its all-time high of mid-1953. Both nondurables and minerals were back at their earlier highs, although durables were still somewhat lower than in mid-1953, owing mainly to substantially lower output of military equipment. Many industries were still showing upward tendencies in April, so it is by no means impossible that the over-all index for that month will reattain the all-time peak. This would be truly impressive, for last fall most observers could see little prospect of such an occurrence at any time in 1955.

Examination of the movement of individual components of the index from February to March points up the fairly general nature of the improvement. Strength in durable goods reflected gains in the output of automobiles, trucks, steel, building materials, farm equipment, producers' equipment, consumer goods, and metals. Output of nondurables rose mainly because of further gains in the chemical, paper and leather-product industries, all of which had been operating at exceedingly high levels. The minerals component of the index showed no change from February, as a cutback in coal production, on a seasonally adjusted basis, offset a rather appreciable gain in the output of metals, stone and earth minerals.

On the sales front the pattern is not as clear cut, but here, too, there does seem, for the present at least, to be a preponderance of favorable influences. Retail sales in the first quarter of the year ran at appreciably higher levels than in the third quarter of 1954, before the business revival got under way. Percentagewise the gain appears to have been in the neighborhood of five per cent, when seasonal factors are taken into account. It is true that this is less than the percentage gain in industrial production, but this in itself is in no way surprising, since trade receded less than output during the recessionary movement of 1953-54.

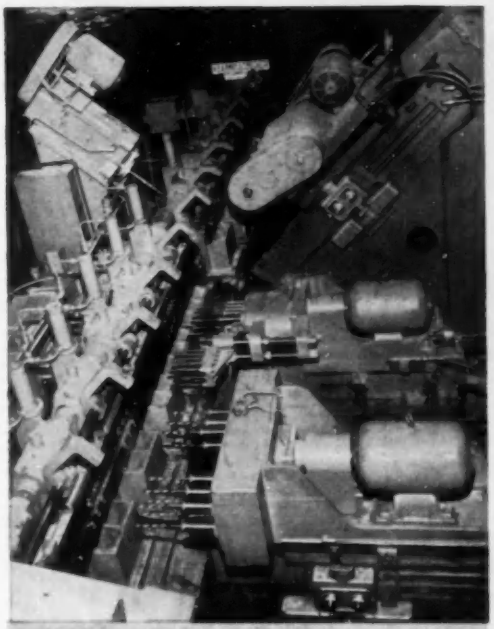
Automobiles Lead

The greatest single factor in the rise of trade since last fall has, of course, been the expansion of automobile sales, but other types of merchandise have registered gains as well. In the first two months of the year, retail sales other than automotive ran close to 2½ per cent higher than in the third quarter of 1954. Durable-goods sales other than automotive showed only a fractional gain, but nondurables ran about 2.7 per cent greater.

The pattern of sales other than automotive since the beginning of the year has been somewhat disappointing. Instead of expansion there has actually been some backsliding. As yet it is too early to judge

(*Turn to page* 140, *please*)

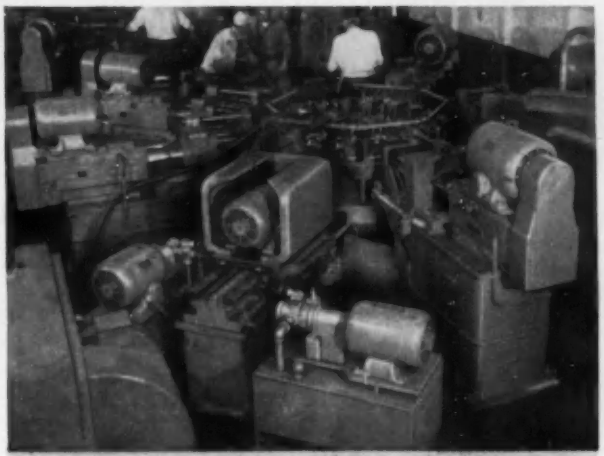
VICKERS HYDRAULICS Helps Cut Costs at PACKARD . . . on Wide Variety of Jobs in New V-8 Engine Plant



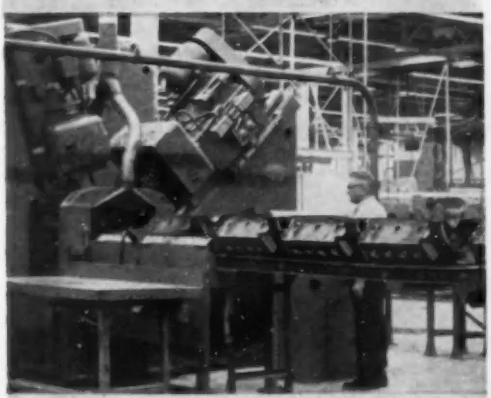
Kearney & Trecker machine for drilling and counterboring bearing caps. Note Vickers Traverse and Feed Cycle Control Panels visible on two heads; advantages include smooth and constant feed rates, easy adjustability, compactness and simplified installation.

Representative of the many and varied production machines equipped with Vickers Hydraulics in the new Packard V-8 Engine Plant at Utica, Michigan are those shown here. Among the advantages of Vickers Hydraulics are: (1) simplification of design, (2) adaptable to automation, (3) ease of providing interlocks and overload protection, (4) ease of maintenance with minimum down time. Equally important, Vickers Hydraulics gives you the benefits of a nation-wide and full-time field engineering and service organization.

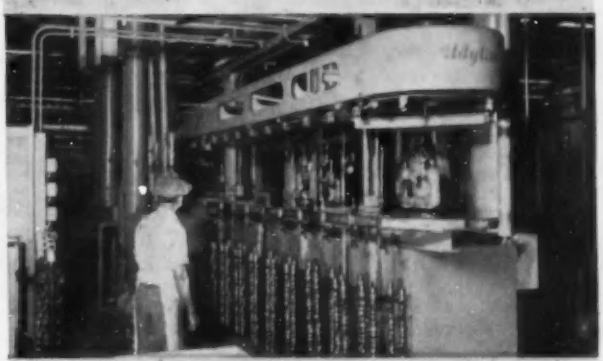
The Vickers Application Engineer near you will be glad to show you the benefits you can obtain by using Vickers Hydraulics. Write for a copy of Bulletin 5002.



Michigan Drill Head Co. 8 station dial machine for connecting rods and caps. Vickers Hydraulic Power Units shown are complete hydraulic "packages" (pump, electric motor, valves, oil reservoir, filter, etc.) that simplify design, and save installation and maintenance costs.



Three Greenlee Transfer Machines in automatized cylinder block line use Vickers Hydraulics. Compact Vickers Traverse and Feed Cycle Control Panel shown on head assures smooth and constant feed rate regardless of fluctuations in tool resistance or changes in hydraulic pressure or volume.



Udylite Automatic Processing Machine saves space and assures more uniform quality by using Vickers Hydraulics to raise, lower and transfer cam shafts through cleaning, coating and rinsing baths in "Lubriting" process.

7109

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

AIRBRIEFS

By RALPH H. McCLARREN

First-Class Mail by Air

The United States Post Office Department has been experimenting in certain sections of the country in sending first class mail by air. This experiment has been in line with the Post Office Department's desire to give preferential service whenever and wherever possible to first-class mail.

A survey made by the Post Office Department of the New York-Washington and New York-Chicago runs revealed that 40 per cent of the time, mail was arriving as quickly as airmail; that 40 per cent of the time it was not arriving as quickly as airmail but arriving quicker than surface transportation and 20 per cent of the time it was arriving at roughly the same time it used to before the air experiment for first-class mail was adopted.

From New York Post Office to Chicago Post Office the time by air averages eight hours compared to the 20 hours required by rail. From New York to Jacksonville the rail time is 26 hours as against 10¾ hours by airlift. On the recently inaugurated experiment on the Pacific Coast from Los Angeles to Seattle the airlift time is 11¼ hours compared to the rail time of 38¾ hours.

These figures were presented in testimony before a House Appropriations Subcommittee by Postmaster General Arthur E. Summerfield and Assistant Postmaster General E. George Seidle. It was pointed out by Mr. Summerfield that the Post Office Department is partial to no one transportation medium and is guided in its purchases by the same motives as those of any other prudent shipper who seeks economy and efficiency as well as good service.

In 1954 railroads were paid a total of $318,000,000 for moving the mail. During the experiment of moving first-class mail by air in 1954 the three-cent mail airlift cost about $2,000,000. It was also noted in the testimony presented that between February 1, 1953, and December 31, 1954, 350 mail carrying trains were discontinued; 311 of these were discontinued on railroad initiative.

It seems that the railroads have gone to court and asked for a ruling that the three-cent air mail experiment is illegal. The court found, however, that the experiment is legal "as long as it is not unduly prolonged," but that new legislation would be required if it is to become a permanent operation. It is further noted that the Post Office Department states that the first-class airlift experiment has not had any appreciable effect on the revenue from regular airmail. The three-cent mail is carried on a space available basis estimated in advance.

Airport Business Soars

The Port of New York Airport business boomed in 1954. The Port of New York Authority operates Idlewild and LaGuardia Airports under a city lease. According to their annual report Idlewild handled almost 3 million passengers in 1954 compared with under 2½ million in 1953. Airmail increased almost 47 per cent and air traffic increased 15 per cent.

At LaGuardia Airport, which airport has long been considered to have reached the "saturation" point in air traffic, an increase of almost four per cent in air traffic was realized during 1954 compared to 1953. LaGuardia's gross operating revenues were $2,787,192 —about $200,000 more than the year before. Idlewild grossed $6,867,073 for 1954, an increase of more than $1,700,000 over 1953.

The New York Port Authority has started a $60 million terminal city project at Idlewild which will provide hotel accommodations, a shopping center and vast new facilities for handling aircraft. The new equipment will provide for the handling of 140 planes at one time.

Jet Airliner

The new Trans-Canada Air Lines' Viscount, a British built jetliner, is now being put on regular schedule on some of TCA's routes. The New York to Toronto schedule was started on April 4. Then, too, remember that Capitol, operating in the United States, will soon have Viscounts on many of their schedules.

Explosion Suppression Installed

An item appeared in the March Airbriefs entitled "New Safety Device," a system which operates on the principle of snuffing out a fire within a few milliseconds of the time in which it starts. It was developed by Simmonds Aerocessories, Inc., of Tarrytown, N. Y.

(*Turn to page* 165, *please*)

This consists of a GAS-GASOLINE or DIESEL ENGINE driven GENERATOR SET of the proper size to meet your needs and equipped with SYNCHRO-START controls to AUTOMATICALLY start the engine the instant the main source of power fails.

For the past twenty years we have been making the dependable controls that automatically start these stand-by power plants when power is required, and to stop them when power is no longer needed; also, to protect them from damage due to an abnormal condition while starting and running.

Synchro-Start Automatic Controls are constantly protecting lives and property all over the world — on the seas, in the air, on land and in the mines.

If you are not acquainted with the DEPENDABILITY and ECONOMY provided by SYNCHRO-START Controlled Power Plants, ask your engine manufacturer — engine dealer — engineering firm — architect or write us for our catalog and nearest representative. There is a stand-by power plant to meet every power need.

SYNCHRO-START PRODUCTS, INC.

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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 43

Fruehauf Expanding One Plant; Purchasing Another in Ohio

Bolstered by high sales during the first quarter, Fruehauf Trailer Co. has announced plans for expansion of its Fort Wayne, Ind., plant, which will increase capacity by 95,648 sq ft. In addition, the company has purchased a 100,000 sq ft factory at Delphos, O., about 47 miles from the Fort Wayne plant, where it will produce special types of trailers. The Delphos plant brings to 10 the number of plants now operated by Fruehauf.

Fruehauf sales for the first three months were 46 per cent higher than in the 1954 quarter in totaling $47.970 million, while net earnings climbed to $1.7 million, nearly 600,000 over those in the same 1954 quarter. The company noted that sales of commercial trailers in March alone were 30 per cent higher than in any previous month in history.

Air Pollution Group Plans Annual Parley In Detroit

The smog problem will come up for attention again at the annual meeting of the Air Pollution Control Association, to be held in Detroit, May 23 to 26. Topics for discussion will include the effects of air pollution on animals, plants and human life, and new smog control methods.

Numerous Products And Services Viewed at Fourth Aviation Show

Jet power plants, propellers, hundreds of components, and services for the aircraft industry were exhibited at the Fourth International Aviation Trade Show in New York City from May 4 to 6. The some 65-odd exhibits ranged from a huge display of jet engines by Curtiss-Wright Corp. and General Electric Co. to small booths displaying nuts and bolts.

Bendix Aviation Corp. was on hand with its line of ignition analyzers, ignition systems, connectors, leads and harnesses, while DoAll Eastern Co., Inc., had a working demonstration of a power saw. Saginaw Steering Div., General Motors Corp., displayed ball bearing screws and splines, and Orchard Industries, Inc., showed aircraft tubes, ducts, lines, and couplings.

In the booth occupied by Van der Horst Corp. of America were examples of engine parts reclaimed by the company's porous chrome electroplating process. Also found in the Van der Horst display was a new type of ball and roller bearing extractor.

Other exhibitors and their products included: Beemer Engineering Co., screw thread inserts, castings, metal powder parts; Chicago Forging and Manufacturing Co., aircraft fittings; Cleveland Industrial Tool Co., titanium and precision aircraft parts; Heintz Manufacturing Co., jet components; Revere Corp. of America, switches, thermocouples, valves; Sterling Precision Instrument Corp., magnetic clutches, differentials, gear heads; and Tube Turns Div., National Cylinder Corp., forgings.

JET TRAINER FOR AIRCRAFT CARRIER OPERATIONS

First jet trainer designed to operate with Navy aircraft carriers, the new Lockheed T2V-1 schoolplane (foreground) sets a fast pace for its predecessor (top), the veteran Shooting Star trainer. The T2V-1 has numerous new safety and performance features, such as a new "boundary layer control" system. Provisions have been made for two types of jet engines—either the Allison J33-A-22 (6100 lb of thrust), which is planned for production planes, or, as an alternate, the Pratt & Whitney J48-P-3

New Engine Will Power Two Rolls Royce Models

Rolls Royce, Ltd., has announced the production of two new models. They are the Rolls Royce Silver Cloud, which will replace the Silver Dawn, and the S. Series Bentley which will replace the B7 model.

Both cars have the same new engine, chassis, and body work and the basic difference between them lies in the fact that each model retains its own radiator grille design. The six-cylinder engine has a compression ratio of 6.75 to 1 and a displacement of 298 cu. in.

Gen. Ridgway Is Considered For Kaiser Argentine Post

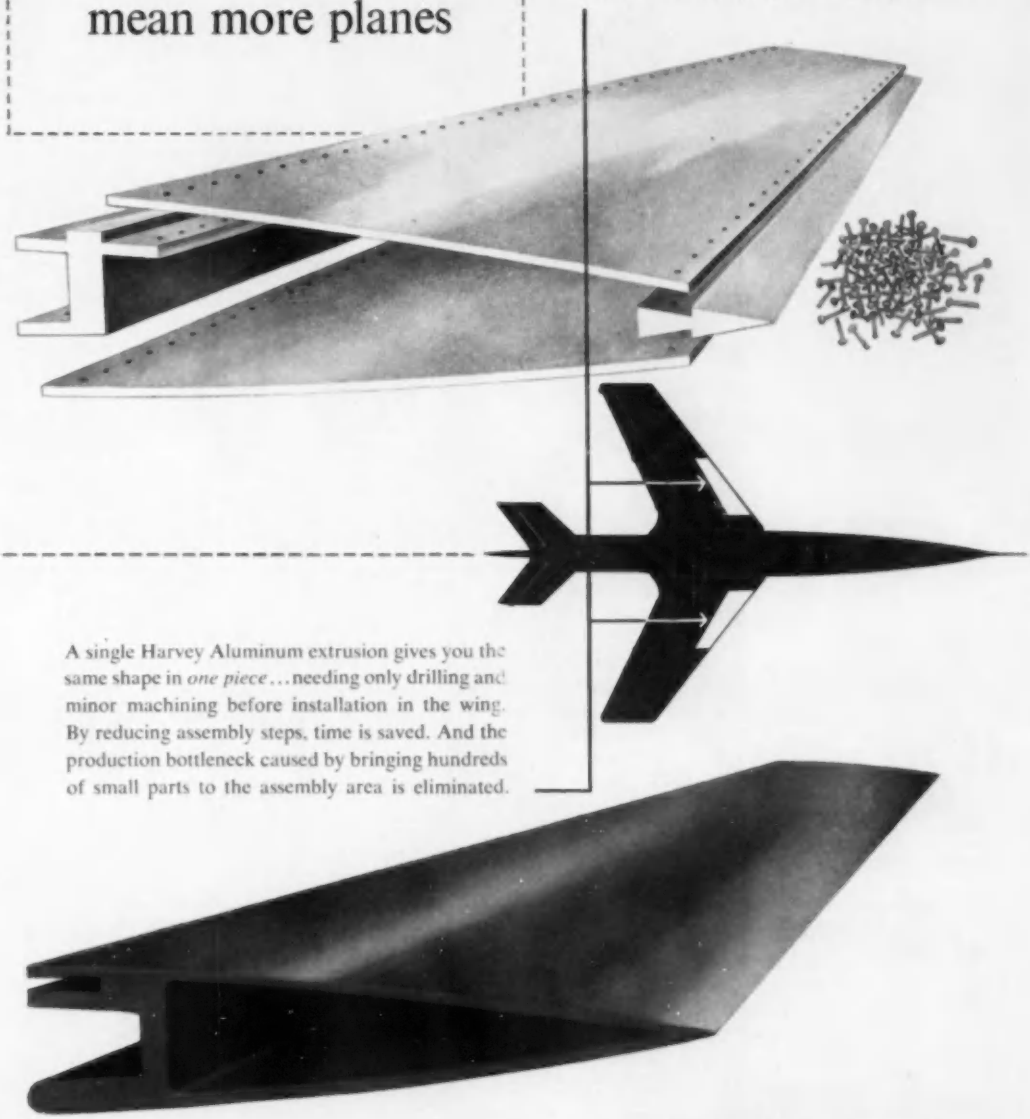
Gen. Matthew B. Ridgway, Army chief of staff, may become president of Industries Kaiser Argentina, a new automobile company set up by Kaiser and the Argentine government.

Edgar Kaiser, vice-president of the Kaiser interests, reportedly has discussed the matter with Ridgway. The latter is to retire from the Army in August.

(*Turn to page* 216, *please*)

Harvey extrusions . . . how fewer parts mean more planes

You *could* make this wing spar and leading edge from a number of small extrusions, milled aluminum plate and hundreds of rivets. But you'd waste hundreds of man-hours unnecessarily . . . because there's a *better* way to do the same job.



A single Harvey Aluminum extrusion gives you the same shape in *one piece*... needing only drilling and minor machining before installation in the wing. By reducing assembly steps, time is saved. And the production bottleneck caused by bringing hundreds of small parts to the assembly area is eliminated.

MAKING THE MOST OF ALUMINUM . . . FOR EVERYONE

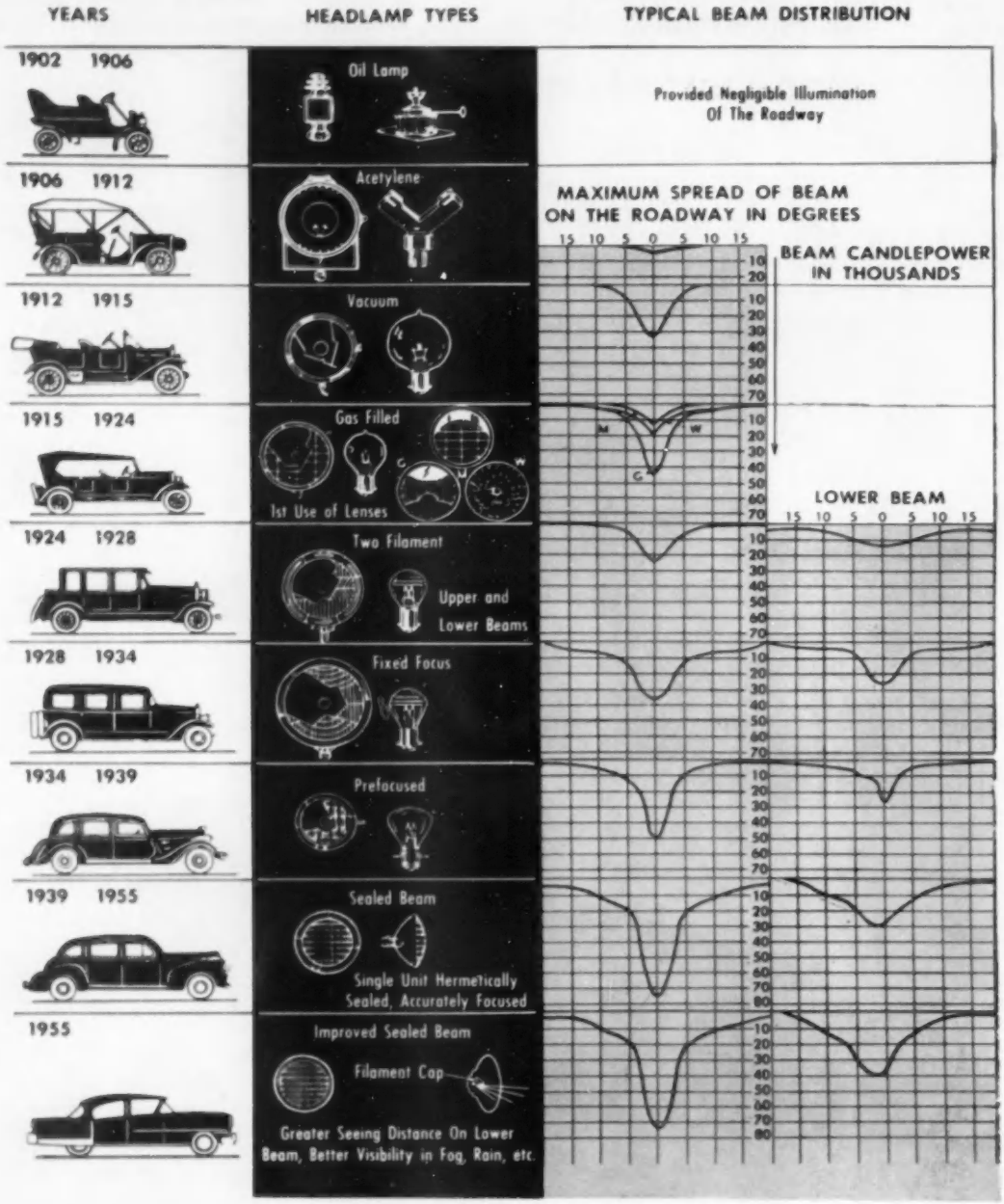
RESEARCH . . . DEVELOPMENT . . . PRODUCTION

Harvey does all three as a leading independent producer of aluminum extrusions in all alloys and all sizes, special extrusions, press forgings, hollow sections, structurals, rod and bar, forging stock, pipe, tubes, impact extrusions, aluminum screw machine products and related products. Also similar products in alloy steel and titanium on application.

HARVEY Aluminum

HARVEY ALUMINUM SALES, INC., TORRANCE, CALIFORNIA—BRANCH OFFICES IN PRINCIPAL CITIES

Automobile Headlamp History



WHEN automobiles came along just before the turn of the century, the problem of lighting the road at night became a serious one.

In the old horse-and-buggy days, all that had to be done was to put a light on the vehicle so it could be seen at night. The horse was trusted to find his way along the dark roadway. But, in the new horseless carriage, steering was the driver's responsibility and he needed more light to see by.

By 1904, a few pioneer drivers were following the light of carbide or acetylene lamps, which represented the first step in the progress of automotive headlighting. The gas lamps

(*Turn to page* 124, *please*)

ANTISEP
All-purpose water-soluble base

—for a real COOL cut . . .

get the COOLING ACTION of a mountain stream and faster, cleaner cutting, too!

ANTISEP All-purpose Base gives you everything you want for tough machining jobs. It has extra lubricity to insure fast, free-cutting on tough metals, helps impart a finish to make any machinist proud. It is anti-welding, helps prevent chip build-up on tools. But all of this is only part of the real value of ANTISEP.

Because this super base is mixed with water, it assures *cool* operation at maximum feeds and speeds and at *low cost*. You can step up production measurably, and still have a smoke-free plant and finer finished work.

Put ANTISEP to the test on the toughest jobs in your plant and see the evidence with your own eyes. Call your Houghton Man today or write direct to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

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All-purpose water-soluble base

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PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

Indianapolis Speed Classic Preview

(*Continued from page* 61)

Old faithful, never-say-die Novi, powered by a 183-cu-in. 8-cyl supercharged engine, is ready to go once more. Still regarded one of the most powerful cars at Indianapolis, its fortunes will be entrusted to youthful 1952 winner Troy Ruttman.

This year, chief mechanic Jean Marcenac's only changes are use of spot-type brakes and magnesium wheels. The 20-in. diam wheels are specially made for the Novi by Halibrand Engineering Co. They're one-section cast magnesium and have no ribs. Walls are 5/16-in. with slight 3/16-in. taper. A prototype wheel weighed 22½ lb. Design is Rudge-type, serrated, with conventional wing nut.

Eight entrants have the necessary attaching brackets to permit use of power steering equipment. Five new Kurtis-Kraft-built cars are designed for power steering units: Ansted Rotary Engineering Special, Zink Special, Anderson Special, Sumar Streamliner, and Belanger Special. The Crawford Special, Jones and Maley Special, and Chapman Special also have the necessary bracket mountings.

All the eight cars, whether designed or modified for power steering, have conventional drag link mechanical steering, too. Monroe Auto Equipment Co., Monroe, Mich., whose Indianapolis activities William M. Clark directs, supplies shock absorbers for some of the race cars. This year the company is providing its power steering systems.

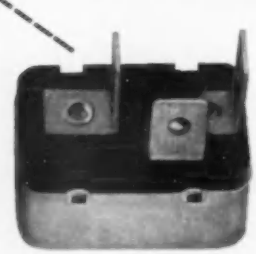
The system consists of belt-driven hydraulic pump, power cylinder with integral control valve, interconnecting hoses, and necessary adapters and parts to make the unit an integral part of the steering linkage. The hydraulic power unit contains the power cylinder and piston at one end, control valve at the other. Movement of the control valve, resulting from the turning of the steering wheel, directs hydraulic pressure to either the right or left side of the piston, depending on the desired direction of turn. With the piston rod end attached to the frame, the pressure causes the cylinder to move. The movement passes to the wheels through a short drag link connecting the body of the cylinder to the steering arm.

The power cylinder is a production unit supplied by Monroe to some automobile manufacturers. Minor modification makes it applicable for mounting on the race car chassis. Halibrand Engineering Co., Culver City, Calif., and L. A. Lesovsky, Los Angeles, built the parts for adapting the unit to the Speedway cars. The unit has a tapered pitman pin which fits the tapered hole in the pitman arm, as in passenger cars. Speedway cars have a straight rather than tapered hole in the pitman arm. A new straight pin now goes through the valve section of the power cylinder. Speedway cars conventionally utilize a direct drag link drive. A yoke now attaches to the exterior of the power cylinder, with a short drag link built to connect the cylinder to the forward steering arm.

The hydraulic pump is driven from a special pulley, built by Meyer &

When Directional Signal Flashers were adopted by the automotive industry, Fasco responded with one that met all requirements . . . instant indication, circuit failure warning, economy, convenience, dependability . . . plus *circuit protection!* The present model is made to operate any directional signal system . . . comes in 2 or 3 wire designs for use with single or double pilot light circuits.

Here's another example of why it always pays to — CONSULT FASCO . . . FIRST!



AUTOMOTIVE DIVISION

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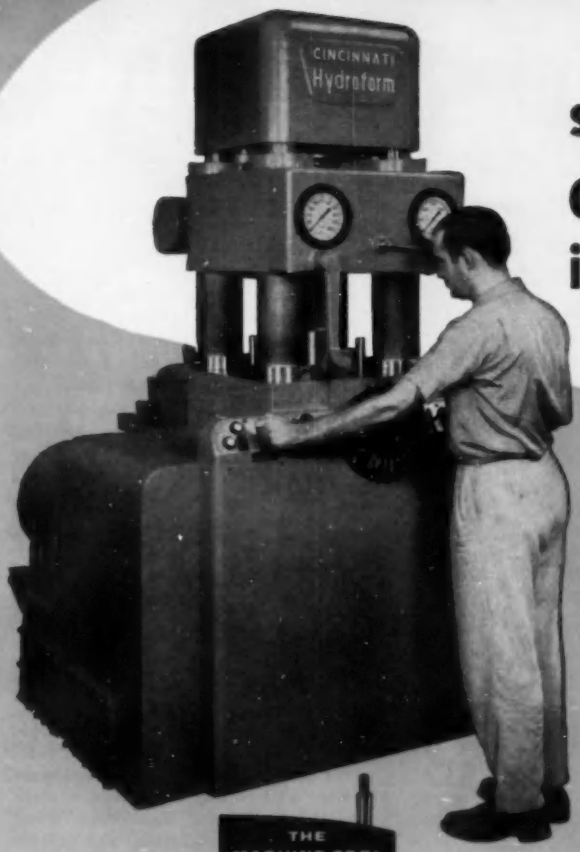
small size producer of BIG SIZE SAVINGS in metal forming . . .



The New Cincinnati 8" Hydroform

The new Cincinnati 8" Hydroform duplicates the performance of its larger family members—the 12", 19", 23", 26", and 32" size machines—by producing a wide variety of deep drawn parts . . . with lower tooling costs . . . at a faster rate . . . and with higher standards of quality than is possible to obtain by other methods.

And it takes up less plant floor space than some soft drink dispensing machines occupy.

Typical examples of work formed on the 8" Hydroform are shown at left. Listed below is a table of major machine specifications.

If your manufacturing requires the production of drawn shapes in small lots—or extensive development work prior to quantity production—let a Cincinnati Milling field engineer show you how the many Hydroforming advantages can be profitably applied to your work. For a description of the Hydroforming process and specifications of the six machine sizes, write for Bulletin M-1759-3.

SEE HYDROFORMING BOOTH No. 1200

Reflector of .020" Aluminum, drawn, pierced and trimmed in one operation.

Electrical Detail of .042" stainless steel, drawn in two operations.

Jet Engine Detail of .032" Inconel, drawn with flange on an angle with the balance of the part in one operation.

Cover of .060" 250 Aluminum, drawn in one operation.

Work Capacity:
Maximum Blank Diameter—8"
Maximum Draw Depth—5"
Maximum Blank Gage—⅛" Steel
Maximum Forming Pressure—15,000 psi

Machine Operating Rate:
Maximum—200 cycles per hour

Dimensions:
5' x 5' x 7½' high

Weight:
Machine Net—12,000 lbs.

Installation:
Floor Mounted. Requires water and electrical connections.

Hydroform

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
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Use FAIRFIELD GEARS

the POWER and PERFORMANCE OF YOUR PRODUCT

There's hardly a power driven machine built that doesn't depend on gears for its get-up-and-go—its productivity—and very often *its reputation.*

No wonder, then, why more and more manufacturers insist on Fairfield Gears for their QUALITY—and also for their mass-production ECONOMY.

No matter what type or size of gears you require, it will pay you to check with Fairfield first. Take advantage, too, of Fairfield's helpful engineering services. *Your inquiry will receive prompt attention.*

Ask for interesting, illustrated bulletin.

Fine Gears Made to Order

SPUR GEARS—Straight, helical, and internal. Sizes from 16 pitch, 1½" dia., to 1½ pitch, 36" dia.
HERRINGBONE—(Follows Type). Sizes from 1½" to 15".
SPIRAL BEVEL—Sizes from 16 pitch, 1½" dia., to 1½ pitch, 28" dia.
STRAIGHT BEVEL—Sizes from 16 pitch, 1½" dia., to 1½ pitch, 28" dia.
HYPOID—Sizes from 1½" to 28" dia.
ZEROL—Sizes from 16 pitch, 1½" dia., to 1½ pitch, 21" dia.
WORMS AND WORM GEARS—Worms to 7" dia. Worm gears to 36" dia.
SPLINED SHAFTS—Lengths to 52". Diameters from 1" to 6".
DIFFERENTIALS—10,000 to 300,000 inch pounds capacity.

Note: All sizes above are approximate.

FAIRFIELD MANUFACTURING CO.

for FINE GEARS

2303 SOUTH CONCORD ROAD • LAFAYETTE, INDIANA

Drake Engineering Co. of Los Angeles, attached to the Offenhauser engine at the forward end of the camshaft.

Speedway cars planning to use power steering need two brackets attached to the frame: one for attaching and supporting the pump; the other holds the piston rod end of the power cylinder unit.

Several new developments in wheels and brakes come from Halibrand Engineering Co., Culver City, Calif. Last year's 18-in. cast magnesium wheel (see AUTOMOTIVE INDUSTRIES, May 15, 1954, p. 88) has a three-eared forged wing nut this year. The 18-lb wheel itself is improved over last year's model by addition of a pressure plate, integrally cast with the wheel. This plate assists in guiding the wheel onto the driving pins. It's expected to speed up each wheel change by two or three seconds. The casting was lightened by design changes in wall thicknesses to compensate for weight added by inclusion of the pressure plate.

An entirely new 16-in. model wheel of cast magnesium is also available this year. It's designed principally for front wheel use at the Speedway. Rim, wall section, and pressure plate are cast in one unit. The wheel weighs 13½ lb, probably the lightest magnesium wheel of this size developed for Indianapolis use. Wall sections are more dished in shape than other models. This provides a greater sectional modulus and eliminates heavy rib-type wall sections, according to designer Ted Halibrand. Walls are vented for better air cooling of tires as well as brakes.

It's likely there will not be a single wire-wheeled car in the race this year, so the trend away from them will be complete.

There's a modification in the dual-spot aircraft-type brakes introduced by Halibrand last year. Redesigned mounting brackets use sliding pins, eliminating the shackles. This change is expected to give the brake greater stability and efficiency by maintaining proper alignment at all times.

Firestone Tire & Rubber Co. has two completely new series of tires for this year's race. Redesigned and engineered front and rear tires are claimed to be safer, better balanced, longer wearing, and make for improved handling.

Both front and rear tires have a slightly narrower and thicker tread. Firestone reports an improved six-ply Nylon cord body locks the cords and gives them a fixed "set," prevent-

(*Turn to page* 123, *please*)

Production Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

MASSIVE FLYWHEELS COMPLETED IN ONE AUTOMATIC OPERATION

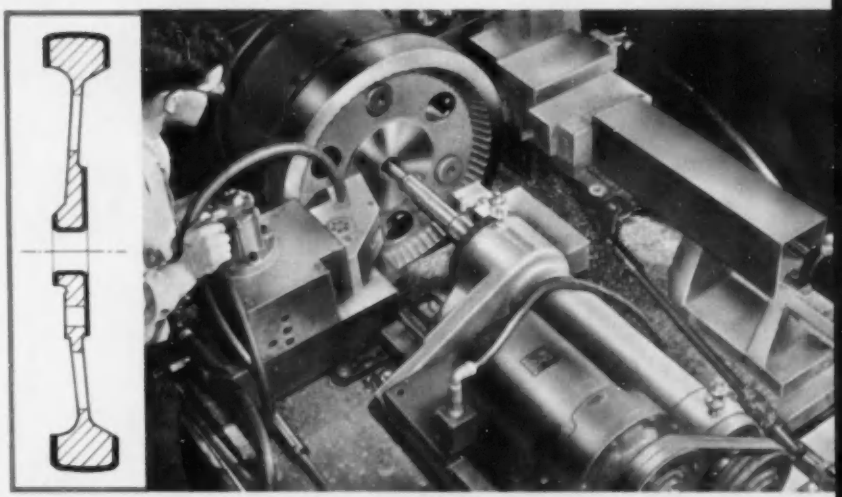
Simplimatic Automatic Lathe and Balancer Team Up to Drive Down Costs

All machining on this 320-lb. cast-iron hay baler flywheel is completed in one chucking on this Gisholt Simplimatic Automatic Lathe. The part is chucked in three cored holes in the web. V-grooves in the chuck jaws centralize the work and give a true-running web. Spring-loaded jacks provide support and eliminate vibration.

Four front slide tools straddle face the rim, face the center pad and chamfer the back edge. A cam-guided tool on the rear slide turns the OD crown and another tool chamfers the outer edge of the rim. Both slides have automatic tool relief. Two tools on a piloted speeder boring bar mounted on the center slide finish the bore and a third tool chamfers. A back boring attachment, operating through the spindle, completes the job by shave facing the back pad and chamfering the bore. Eleven tools machine ten surfaces in seven minutes f.t.f.

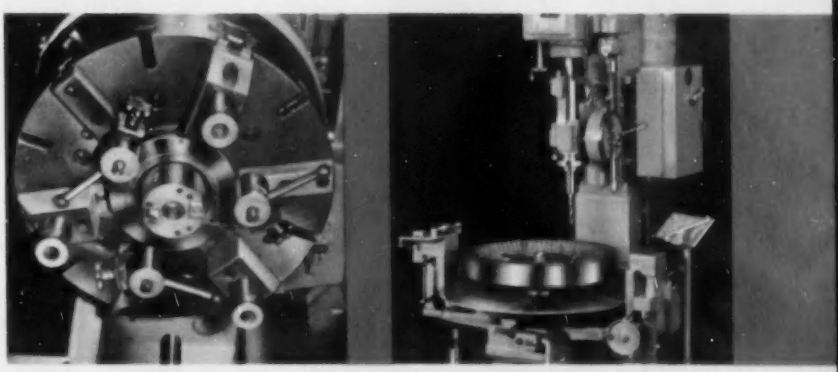
While a new workpiece is being machined, the operator places the completed part in a Gisholt 14E Static Balancer. This is arranged with correction equipment so that unbalance can be measured, located, corrected and inspected in one handling.

From rough casting to machined and balanced flywheel—all done by one operator and the two Gisholt machines.



Heavy lines show ten surfaces machined in one chucking.

Close-up of workpiece and tooling. Note speeder boring bar arrangement to give required cutting speed in small bore diameter.



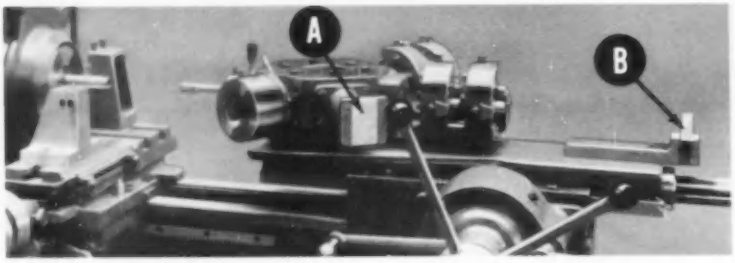
V-grooved chuck jaws and spring-loaded jacks. Back boring attachment tools feed out through the spindle to face back pad and chamfer bore.

Gisholt 14E Static Balancer with integral correction equipment. Up to 600 ounce-inches of unbalance can be quickly measured.

TIME-SAVING IDEAS

HOW TO DO LONG SHAFTS ON SHORT LATHE

Ram Type Machine Shows How Good Idea Can Save on Equipment Costs



The long and short of this pointer is worth remembering the next time you have a problem like it.

Here, a Gisholt No. 4 Ram Type Turret Lathe, which has 25¾ inches from hexagon turret face to spindle, is handling a 46⅝-inch-long shaft. The seamless steel tubing is fed through the spindle and locates against stock stop "A" for simple turning, reaming, necking and threading operations. Then the hexagon turret is indexed so that stop "A" again faces the work. The stop is hinged and flips up, permitting the bar stock to pass completely through the turret and locate against stop "B." The body of stop "A" acts as a steady-rest to prevent whip while the shaft is cut off to length from the rear tool post on the cross slide. Stop "B" then also swings out of the way for easy removal of the finished shaft. The whole job takes only 2.75 minutes floor-to-floor.

By simply allowing the workpiece to pass through the hexagon turret, a shaft nearly twice the length of the machine's capacity can be handled—sparing the need for a larger, more costly lathe.

TURRET-MOUNTED LOADER SPEEDS CHUCKING

Gisholt Fastermatic Automatic Turret Lathe uses Loading Arbor to Save Time and Effort.

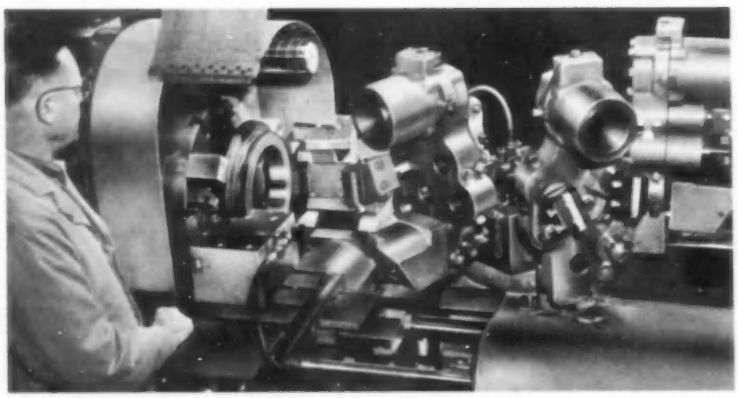
Even if you have your machining time down pat, you may still be able to cut over-all time further with a better loading method.

Here, to simplify and speed up chucking operations, this 2F Fastermatic has a special turret-mounted loader arrangement. As each machine cycle ends, the finished part is removed. Then forward movement of the hexagon turret carriage brings a rough workpiece on the loading arbor to the chuck. Spring-loaded studs on the arbor force the piece against the chuck jacks to locate the work.

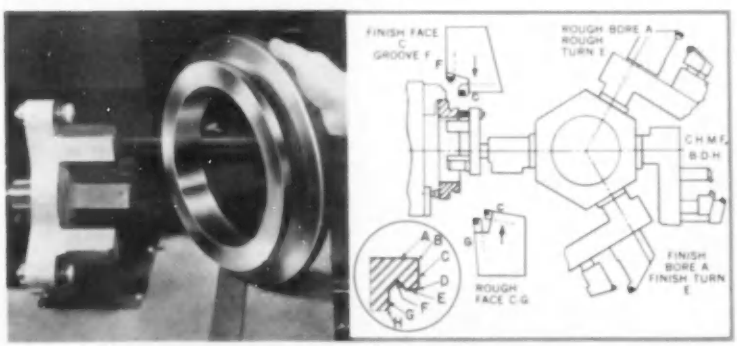
With simplified loading and chucking and a fully automatic machine cycle, time is just 6.9 minutes f.t.f.

The hexagon turret stations are tooled to turn, bore and chamfer with all facing and grooving operations on the steel rings performed from the front and rear cross slides.

Using a loading arbor on one turret face of the Fastermatic Automatic Turret Lathe reduces manual effort and simplifies chucking.



Tooling setup for first operation machining on steel rings.



Here's the special turret-mounted loader. Also a finished part showing surfaces machined.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE DOUBLES AT SUPERFINISHING AND BEARINGIZING

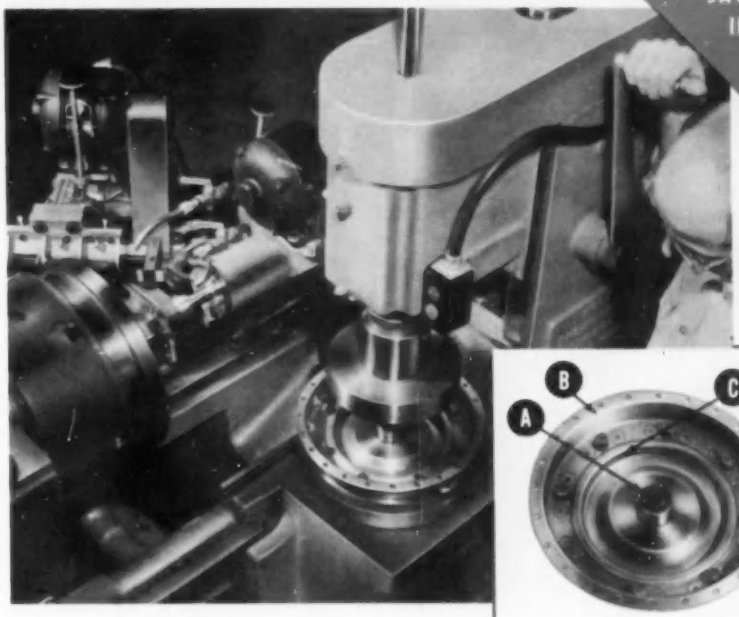
Gisholt No. 12 Hydraulic Lathe Adapts for Special Work

For many of those special jobs that come along present equipment can lend a hand. This unique application of a Gisholt No. 12 Hydraulic Lathe, where three jobs are performed in one handling, is a good case in point.

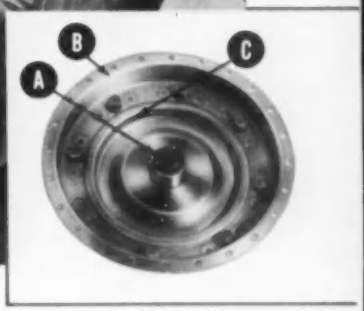
Here, it is specially tooled to finish automotive transmission converter clutch housing and bushing assemblies. Two No. 1 Superfinishing attachments are mounted on the rear independent slide. One Superfinishes the flat hub face (A) of clutch housing for thrust washer contact. At the same time the 45-degree sealing face (B) is also Superfinished.

While this part is being Superfinished, the preceding workpiece has its 8-inch bore (C) sized and finished by a vertical Bearingizer unit, also mounted on the No. 12 Hydraulic Lathe.

Production is fast—over 50 parts per hour. Tolerances are closely held and the required "controlled" surface finish readings easily obtained.



By simple adaptation, this No. 12 Hydraulic Automatic Lathe performs as a special machine to produce Superfinished and Bearingized parts.



To show tooling, Superfinishing quills are withdrawn, Bearingizer unit is raised. While part is Superfinished, another is Bearingized.

THREAD-GRINDING WHEELS BALANCED FOR MORE PRECISE WORK

Gisholt DYNETRIC Balancer Measures, Locates Unbalance to Eliminate Harmful Vibration

Thread-grinding wheels operate at high speeds and therefore must be very accurately balanced to eliminate vibration which would hamper grinding to close tolerances. For this type of workpiece, where the length along the axis is small compared to the diameter, correction is usually made only for force (static) unbalance.

For fast, simple, low-cost balancing this Gisholt Type 3S DYNETRIC Balancing Machine is used. It is easily set up to measure and locate force unbalance. The strobe lamp flashes on the numbered band and indicates which of the tapped holes provided in the mounting flange plate will receive the correction weight. At the same time, the amount meter tells the operator exactly which weight screw is to be added to bring the part into precise balance.

By eliminating vibration, grinding wheels rotate very smoothly and produce better threads to closer tolerances.

Balancing, performed on new wheels and after dressing old wheels, assures accuracy and improves performance.

DYNETRIC BALANCERS — GISHOLT

Complete courses covering all phases of precision balancing are offered by the *Gisholt Balancing School*. Get details and starting dates.

For A Clear Picture . . .

of the various plans under which you can acquire new machine tools, you'll find this a very helpful booklet. It explains and illustrates time-buying and leasing methods to show how you can benefit from these methods. Write for Booklet P-1173.

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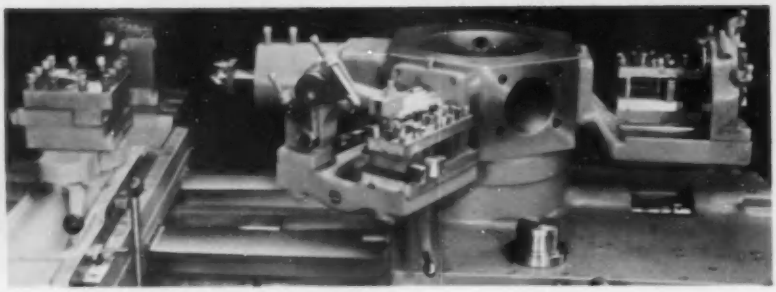
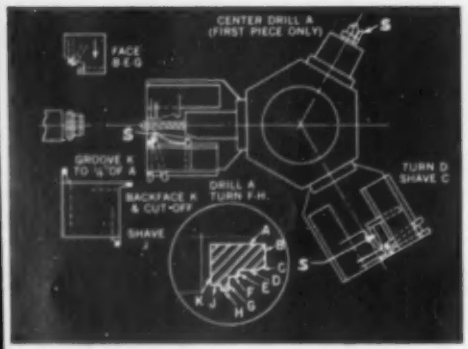
TIME-SAVING IDEAS

MULTIPLE TOOLING ANSWERS SMALL LOT PRODUCTION

This tooling arrangement makes an ideal setup for the various machining operations shown in the layout. As few as five pieces per lot are handled economically this way.



Saddle Type Lathe Produces Coupling Hubs Faster, More Accurately



Here a standard Gisholt 3L Saddle Type Turret Lathe is multiple tooled with lots as few as five pieces handled economically. The lathe is equipped with a bridge-type cross slide and is tooled to machine steel flexible coupling hubs from bar stock.

All tooling for the several different sized parts is pre-set. This includes the group of tools on the rear of the cross slide and also the special tool blocks held in the multiple cutter turners on the hexagon turret. To go from one part size to another, the operator merely changes these special tool blocks and adjusts the multiple cutter turner rollers. Special stops "S" on turret tooling determine the length of all turned diameters and shoulder positions directly from the end of the piece. These stops eliminate the time required to set turret stops. Also, a stock stop to position the work prior to starting machining operations is not required.

With this kind of interchangeable pre-set tooling on Saddle Type Turret Lathe, you have a high-production setup which can be used for small lots.

HOW SPOT CHECKING SAVES TIME ON SUPERFINISHING JOBS

Inspection Equipment on Machine Speeds Small Lot Operations

Operator is checking surface finish reading with inspection equipment mounted on Gisholt 51A Superfinisher.

Superfinishing, as you may know, is the process whereby a "controlled" surface finish can be quickly and economically obtained, piece after piece—whether the specified final finish is 50, 30, 10 or 1 micro-inch RMS.

In small job shop operations, various parts are handled and finish requirements vary considerably. This necessitates some means by which the operator can determine when he has produced the specified surface finish on a part.

This standard Gisholt 51A Superfinishing Machine is equipped with a Profilometer Unit. This provides a means of instant checking the surface roughness of the part being Superfinished at any time during the Superfinishing operation. The part doesn't have to be removed. It's possible to Superfinish each individual part to the blueprint tolerance before leaving the machine.

Superfinishing is made even more efficient and lower cost with this means of keeping a "running" check on surface roughness. It's ideal for handling small lots and where different surface finishes are specified.

Write for book, "Wear and Surface Finish" which gives full information on Superfinish.

No. 5-655
639

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY — Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

(*Continued from page* 118)

ing tread chunking and separation.

The new front tires have two circumferential grooves instead of the three previously used, to give better holding characteristics in operation with the new rear tires. Engineering of the ribs also provides quick visual tread depth of tires in use during the race.

BOOKS . . .

THE STORY OF TIRE BEADS AND TIRES, *by Walter E. Burton, published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $5.00.* Unseen and, until now, largely unsung, wire for years has been combined with rubber to provide one of the most important parts of the automobile—the tire bead. Here is the indispensable element that provides the gripping force to hold tire and wheel together in an efficient whole. This book is the story of the tire bead, and of the National-Standard Co., pioneer and leader in the development and production of wire for beads. It is largely a technical handbook too, bringing together many data and descriptions vital to the design and manufacture of tire beads. The book provides detailed information on wire strength, sizes, corrosion problems, fatigue resistances, bead wire finish, methods of testing beads and bead wire, and descriptions of bead designs and machines for making tire beads.

WELDING FOR ENGINEERS, *by Harry Udin, Edward R. Funk, and John Wulff, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $7.50.* This book offers the reader a thorough appreciation of welding as an art and a science. It is here treated as a field in itself rather than as an offshoot of some other. Drawing on principles from physics, mathematics, chemistry, metallury, and mechanical engineering, the authors carefully construct an understanding that extends not only to welding and joining, but to the other arts in the general field of metal fabricating. Though the emphasis falls on principles rather than practice, the book is realistic and lucid in its presentation and equips the engineer with information and an approach that will enable him to deal with a wide variety of actual welding problems. Each unit process is presented as soon as possible after its basic principles have been developed. As understanding progress, more complicated processes are used for illustration. Wherever possible an analytical approach is taken.

CONVERSION FACTORS AND TABLES, *by O. T. Zimmerman and Irvin Lavine, published by Industrial Research Service, Inc., Masonic Bldg., Dover, N. H. Price, $5.00; foreign, $5.50.* Ten years have elapsed since this manual was initially published. Although much of the material in the first edition is just as valuable today as when the book first appeared, a number of changes in the values of important physical constants were desirable. Among the many new features of the second edition are: an expanded conversion factor section in which all values have been recalculated, based on the latest accepted fundamental values; a section on conversion factors for most of the foreign countries of the world; a section of foreign monetary equivalents; a table of physical constants; and an expanded conversion table section.

Automobile Headlamp History

(*Continued from page* 114)

were fairly effective in illuminating the road, but they were messy and dangerous to use. In addition, they created a new problem—that of blinding approaching drivers with glare. Efficient light, that could be accurately focused and aimed, had to await the development of electric headlamps.

Below is a brief chronology of electric headlighting progress:

1908—The first tungsten-filament electric vacuum lamps were developed for automobile headlights.

1911—Electric headlighting introduced as standard equipment on some cars.

1913—Generator-battery electrical systems became standard on many cars, following introduction of the self-starter.

1915—Introduction of gas-filled lamps. The inert gas atmosphere retarded filament evaporation and notably increased lamp efficiency.

1916—Introduction of V-type coiled filament, providing a more concentrated light source, with increased maximum beam candlepower. A variety of headlamp "gadgets" and so-called "glare-reducing" devices were introduced in this year, including resistance dimming and diffused glare, none of which proved saisfactory.

1920—Gradual appearance of lens and other optical controls on headlamps, such as spreading flutes and bending prisms, or by modified reflector sections.

1924—Depressible-beam headlamps, using two-filament lamps, were in use.

1928—"Fixed focus" headlamps, using reflectors of longer focal length and requiring no focus adjustments, were adopted.

1929—Foot dimmer switches introduced.

1930—Increased candlepower lamps provided more light.

1932—Non-symmetrical meeting beam was developed which put more of light on right side of road.

1934—Higher precision design of prefocused lamp with shorter focal length permitted reduction in the over-all diameter of headlamps.

1939—Introduction of the cooperatively developed Sealed Beam headlamp, which was adopted by the motor vehicle industry for use on 1940 models. This provided one standard, completely interchangeable headlighting system for all makes of cars. The lamp's sealed, single unit construction was designed to give high efficiency headlighting for the life of the lamp. The lamp produced notably increased illumination and achieved improved control over glare from the "traffic" beam.

1954—Announcement of an improved Sealed Beam lamp design, developed by the cooperative effort of vehicle and lamp manufacturers and public officials. The new Sealed Beam unit retained the advantages of its prototype, adding improvements in light distribution, seeing distance and penetration of fog, snow, rain, etc. The improvements were accomplished primarily by lens design changes, adoption of a filament cap and by an increase in the wattage of each beam.

1955—Adoption of the new, improved Sealed Beam lamp as standard equipment by all motor vehicle manufacturers in the U. S. and Canada.

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MODEL S-5-A

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The LAB PULSESCOPE, model S-5-A, is a JANized (Gov't Model No. OS-26) compact, wide band laboratory oscilloscope for the study of all attributes of complex waveforms. The video amplifier response is up to 11 MC and provides an equivalent pulse rise time of 0.035 microseconds. Its 0.1 volt p to p/inch sensitivity and 0.55 microsecond fixed delay assure portrayal of the leading edge when the sweep is triggered by the displayed signal. An adjustable precision calibration voltage is incorporated. The sweep may be operated in either triggered or repetitive modes from 1.2 to 120,000 microseconds. Optional sweep expansion of 10 to 1 and built-in markers of 0.2, 1, 10, 100, and 500 microseconds, which are automatically synchronized with the sweep, extend time interpretations to a new dimension. Either polarity of the internally generated trigger voltage is available for synchronizing any associated test apparatus. Operation from 50 to 400 cps at 115 volts widens the field application of the unit. These and countless additional features of the LAB PULSESCOPE make it a MUST for every electronic laboratory.

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and Other Associated Equipment

Reducing Distortion in Cylinder Liners

(*Continued from page* 57)

continuous furnace. When up to quenching temperature, the trays were removed, liners were picked up individually and placed on mandrels on which they were oil quenched.

After quenching and removal from mandrels, the liners were put through a continuous recirculating furnace and, when cool, underwent two honing operations made necessary because, despite care, some warpage resulted and extra honing was needed to attain a true sizing of the bore. These several handlings proved expensive, as was also the second honing made necessary because extra metal had to be removed to provide a true bore.

In the new setup, the only handling is that required to place liners on racks, load these on the conveyor (seen in the illustrations along with other portions of the new heat-treating setup) and to unload racks and liners when they issue from the setup after heat-treating. Four Ajax salt bath induction furnaces are used to hold and heat the salt that, in turn, applies heat to the liners. These salts are water soluble neutral types that have no chemical reaction with the metal liners. Transfer from bath to bath, the timing in the respective baths and temperatures are all subject to automatic control.

After loading, liners first enter a preheating furnace, in which the salt is held at 1400 F, and remain therein for eight minutes. This is followed by a dwell of the same length in the hardening furnace at 1575 F. Quenching in salt at 400 F requires two minutes in the third furnace. In the final furnace, liners remain one hour at 400 F.

Racks are disconnected from the continuous chain in each furnace but are transferred to other conveyors that move at the speed needed for correct time in each bath. A wash in hot water removes salts after heat-treatment and leaves the liners ready for unracking and transfer to a honing machine using the new form of chuck. Capacity of the heat-treating setup is 400 lb an hour and heating is so done that distortion is virtually nil.

Only a single honing is required and it is done in the same type of chuck used for boring, hence clamping does not cause deformation.

Preparing oscillograph equipment for flight tests of the North American Super-Sabre jet fighter. *Photo courtesy North American Aviation, Inc.*

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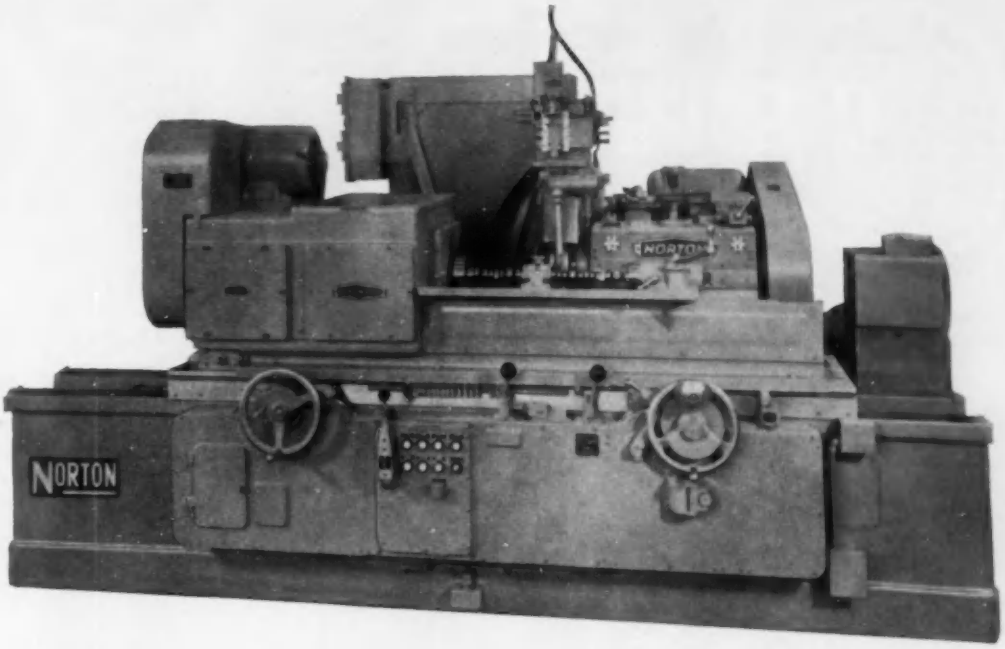
The No. 3 CAM-O-MATIC grinds camshafts better...

BUILT-IN OPERATING SKILL of the No. 3 CAM-O-MATIC Grinder is a typical Norton "Touch of Gold" that adds value and boosts profits. Many automatic features on this greatly improved machine reduce the operator's duties to loading and unloading. He can easily tend two or more machines — while you get better grinding for less money.



Highly advanced automatic grinder sets new standards for production, precision and finish

With the No. 3 CAM-O-MATIC Grinder, Norton introduces a new concept of efficiency in camshaft grinding.

No other machine of its type offers you such a combination of exclusive features, rugged construction and simplified operation. No other machine can do more towards stepping up the quality of your camshaft production, while cutting grinding time and costs.

Greater Rigidity Improves Performance

The No. 3 CAM-O-MATIC Grinder features solid, rigid construction that means minimum vibration, more accurate performance and longer service life. Another big advantage for fluid, shockless operation is that the entire operating cycle is geared to split-second efficiency. Indexing is ultra-smooth and extra-rapid. And the wheel-slide retraction after grinding each cam is no greater than maximum stock removal.

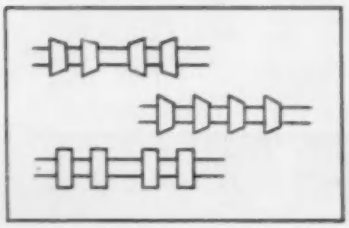
Speed is always right — automatically

The No. 3 CAM-O-MATIC Grinder's automatically compensating work speed arrangement is a valuable aid to faster, more accurate grinding. Starting with the ideal speed for rapid stock removal, it changes to exactly the right speed for fine finishing and contour accuracy — as each cam is being ground. This eliminates guesswork, manual adjustment and lost motion.

Wheel truing is automatic, too

Still another example of built-in operating skill is the wheel truing device, in which the truing diamond is automatically advanced across the wheel face and back, cutting in both directions. This is done while the operator is loading and unloading, so no time is lost. And by removing only just the amount of abrasive required for truing, the working life of every wheel is prolonged.

Your choice of tapers



The swiveling wheel slide — a Norton patent — permits grinding cam tapers in one direction (standard equipment) or tapers in opposite directions on the same shaft (an optional extra). Both arrangements permit straight-face grinding, as well — thus increasing the versatility of your camshaft production equipment.

See your Norton Representative — or write direct — for full details on the No. 3 CAM-O-MATIC Grinder. And remember, only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

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Aluminum in Automatic Drives

(*Continued from page 64*)

The Heald machines as well as Ex-Cell-O precision-boring machines used on other types of bodies are provided with refrigerant cooling of cutting fluid in addition to positive filtration. This assures close control of dimensional accuracy as well as of fine surface finish free from imperfections.

Near the end of the sequence of operations valve bodies are presented to Maizo Blast machines for deburring, then they are finish-lapped in Micromatic Microflat honing machines, holding flatness to 0.0003 in. A battery of Norton Hyprolap equipment is employed for lapping other parts. In each case only one face is lapped at a time, requiring double-indexing of the work.

The converter housing, largest of the aluminum parts and weighing 18 lb, has the two mounting faces milled in a large vertical type Sundstrand milling machine, using a two-position fixture to present the motor mounting face of one part and the case mounting face of the second part, then reversing the work to complete the other side. Later the motor mounting face is finish-milled in a similar Sundstrand mill, holding the dimension between faces to 7.373-7.378 in. Finish-boring of the large diameter, and finish-boring and countersinking of two dowel holes is performed in a three-spindle Heald Bore-Matic.

The impeller housing, weighing 9.9 lb, is most interesting in detail as all of the rows of blind end slots for receiving the notched ends of blading are cored in the casting and require no further machining. Processing of this part is practically a one-operation job since all machining—including rough- and finish-turning of the entire cavity, turning, facing, boring, and drilling—is done in a special Hoern & Dilts four-station vertical type chucking machine with indexing table.

The transmission extension, longest of the aluminum parts and weighing 5 lb, is prepared for machining by turning two collars—one at each end—in 8A-36 Sundstrand automatic lathes. This is followed by detail operations in two enormous Natco machines provided with trunnion type fixtures. First of these is a special six-station machine tooled for facing both ends, boring and counter-boring, milling, drilling, reaming, and tapping. This is followed by boring, counterboring, and spotfacing of the speedometer and inspection holes—in a setup on five-station Natco special trunnion type machines.

Each of these machines provides an interesting example of the complexity of modern electronic controls, being provided with large cabinets and an extensive system of electrical wiring. In addition, each of the machines is served by an unusually large installation of Vickers hydraulic pumps and controls with associated plumbing.

A No. 332 Heald six-spindle precision-boring machine with three heads is employed for finish-boring the flange end; finish-boring the small end to receive the bushing; and counterboring and facing of the thrust boss. After the bushing has been pressed in on a Denison hydraulic press, it is bored to size in a two-spindle, No. 221 Heald Bore-Matic, holding the bore to a tolerance of 0.002 in. Final operation is handled in an 8 by 36 Sundstrand lathe, fin-

Everything You Want
in a Quick-Connective Pneumatic Coupling

HANSEN SERIES 3-RL
RING-LOCK COUPLING

- Smaller.
- Lighter.
- Effectively handles more volume than any other coupling of equal dimensions.
- Handles any job with fittings from ¼" to ⅛", from the air line to the air tool.
- All Series 3-RL Sockets and Plugs are interchangeable — reduces stock inventory to a minimum.
- One-way shut-off—for pneumatic service applications.
- Positive locking.
- Equipped with automatic sleeve lock.

On any job requiring ¼" to ⅛" connections—from the air line to the air tool—this single size Hansen Ring-Lock Coupling—with completely interchangeable Sockets and Plugs—does it all—makes it easy to keep stock of parts in balance—holds inventories to a minimum.

To connect, you merely push the Plug into Socket. To disconnect, just turn the sleeve. When Coupling is connected, a locking ring in Socket enters groove in Plug, provides positive lock and insures tight fit. Sockets with aluminum bodies are available for use with small hand-operated air tools.

Write for Descriptive Literature

SINCE 1915 — QUICK CONNECTIVE FLUID LINE COUPLINGS
THE HANSEN MANUFACTURING COMPANY
4031 WEST 150th STREET • CLEVELAND 11, OHIO

MUSKEGON

"UNITIZED"

CHROME-PLATED OIL RINGS

CSR-200

First of Muskegon's famous "Unitized" chrome-plated multiple-piece oil rings . . . proved on America's greatest production lines and in the finest cars. Rails and spacer are correctly pre-assembled and "Unitized" to handle like a one-piece ring.

error-proof

. . . installs faster than any other multiple-piece ring . . . and without special installation tooling!

To err is human — and *very costly* on the assembly line. But Muskegon's "Unitized" Piston Rings greatly reduce this cost because they are *always* correctly assembled, handle like a one-piece ring and install faster than any other multiple-piece ring — without special installation tooling.

And what's more, Muskegon gives you *two* "Unitized" oil ring designs to choose from. The CSR-200, Muskegon's chrome-plated, all-steel, pre-assembled oil ring, has set new standards on the production line for faster, more economical and error-proof installation. Now the all-new CSR-400 offers all of the features of the CSR-200, *plus* the advantages of a revolutionary new circumferential expander.

The secret of their success is better design and Muskegon's patented "Unitizing" process. This process holds the pieces together in the right order for quick, easy installation. Then, in the first rush of hot oil, as the engine starts to run, the special adhesive dissolves completely and leaves the parts free to function independently of each other. The chrome-plated rails reduce ring wear and bore wear, scuffing and friction . . . keep the engine new longer and increase oil economy.

But why take anyone's word for it but your own? Get the facts on Muskegon's CSR-200 or new CSR-400 rings for *your* engines.

new CSR-400

Muskegon's most recent development! CSR-400 chrome-plated oil ring with circumferential expander! All four pieces are "Unitized," a Muskegon exclusive, for easy handling and installation.

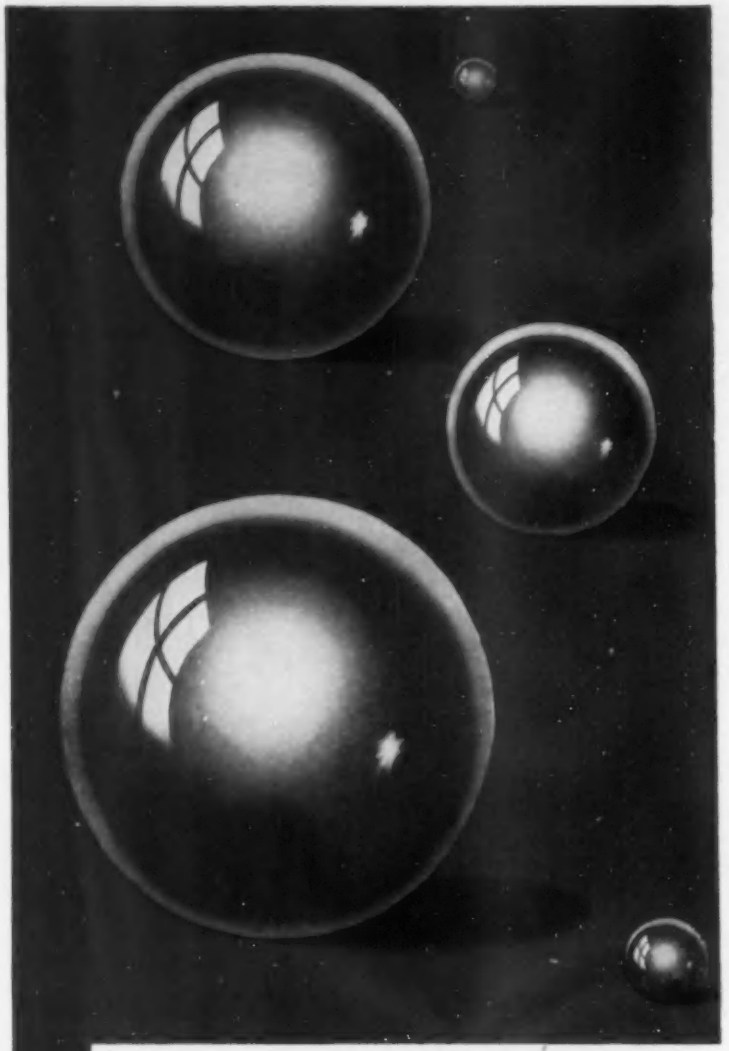
Write or today.

DETROIT OFFICE:
521 New Center Bldg.
Telephone: Trinity 2-2113

MUSKEGON Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

Since 1921 . . . The engine builders' source!



COOLIDGE
Balls

CHROME ALLOY AND STAINLESS

COOLIDGE CORPORATION
MIDDLETOWN, OHIO

ish-facing the flange square with the axis, and holding overall length to 19.31-19.29 in.

A number of the large, multiple-station, multiple-spindle Buhr drilling machines are found in this department, one of the largest of these being illustrated here. It is a six-head machine, fitted with an indexing table and double-index type fixturing for completing all operations on one of the aluminum servo bodies.

Since chips and cutting fluids must be segregated, each machine in this department is fitted with a suitable sheet paper type filter which serves to filter the cutting fluid and at the same time to deposit chips continuously into a chip container. These containers are dumped at intervals and transported to the salvage section.

Cadillac's Plating Plant

(*Continued from page* 78)

Within the plating plant suitable equipment is provided for reclaiming chromic acid, copper and nickel solutions. These are pumped to holding tanks, filtered, rectified, and held ready to recirculate to the plating tanks as needed.

Needless to say, the facilities noted so sketchily above represent an enormous outlay running into the millions of dollars. Cadillac considers all this a worthwhile investment, assuring its users a beautiful, lustrous and durable car finish that stands out in the motoring world.

BOOKS...

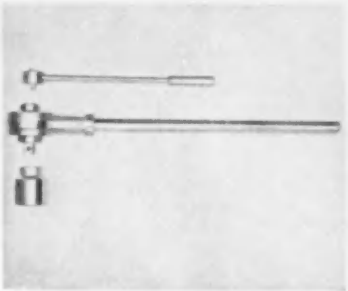
ECONOMICS AND PUBLIC POLICY, *by Arthur Smithies, Joseph J. Spengler, Frank H. Knight, John Jewkes, Jacob Viner, and Lionel Robbins, published by the Brookings Institution, 722 Jackson Place, N.W., Washington 6, D. C. Price, $2.00.* These lectures discuss economics and its application to policy problems. They examine, in turn: economic welfare as an objective of policy; the contribution that economic theory may make to public policy; the central place of freedom, order, and justice as objectives in a changing world; the economist's responsibilities; the relevance of international trade theory; and a further examination of the relation between freedom and order and their policy implications. Here, in a brief review, six leading economists examine the usefulness and limitations of economic theory for the guidance of policy. The need for further theoretical work is also considered.

NEW EQUIPMENT:

New "4-to-1" Geared-Head Unit

generates high torque in limited space with less effort

Bonney Forge & Tool Works, Allentown, Pa., has just announced a new "4-to-1" geared-head wrench for heavy assembly and disassembly work requiring rotary effort over 200 ft. lbs. *An intermediate unit*, the "X-4" is designed for use with ratchets, torque wrenches, sockets, and attachments. Torque is produced through planetary gears.



½" square drive ratchet with Bonney 750X-4 geared-head unit and ¾" square drive socket.

A small, rugged, compact unit, the Bonney X-4 is lightweight and portable . . . ideal for work in close quarters. It makes tightening of threaded parts to specific torque easy and accurate. Known 4-to-1 ratio permits its use as a multiplier for torque wrenches.

In tightening or loosening threaded parts, there is no dangerous snap or jarring action. Easily used in shop or field applications, the Bonney X-4 eliminates need for extra manpower. A mechanic can do his own job with less exertion, greater safety, and without damaging the equipment.

The new X-4 has a drop-forged, heat-treated chrome-moly steel head. All highly stressed parts (including detachable anchor bar) are made of specially heat-treated alloy steels—selected for maximum efficiency and strength. Head and shafts are sealed and lubricated for life.

Complete information is available from: *Bonney Forge & Tool Works, Allentown, Pa.*

1 man + Bonney X-4 = 4 men

New!

Revolutionary!

Labor-Saving!

It's the new BONNEY "X-4"—the amazing, muscle-saving 4-to-1 Geared-Head Wrench! Now, 1 man can do the job of 4 in all heavy assembly and disassembly work! In tightening or loosening threaded parts, there is no dangerous snap or jarring action. The Bonney X-4 *makes tough jobs easy!*

The new BONNEY "X-4" is designed as an *intermediate unit* for use with ratchets, torque wrenches, sockets, and attachments. Rugged, lightweight, portable—the unit is easily used in shop or field. A mechanic can do his own work with less effort, greater safety, with no chance of damaging equipment.

Get the complete story!

BONNEY TOOLS

BONNEY FORGE & TOOL WORKS
Allentown 2, Pennsylvania

Please send me detailed information on the new BONNEY "X-4" 4-to-1 Geared-Head Wrench.

Name_____

Company_____

Address_____

City_____

News of the MACHINERY INDUSTRIES

(*Continued from page 91*)

10 year period. Actually, there may be a slightly higher tax due to increased profits from investment of money freed through leasing.

Recent changes in the Federal tax structure in relation to depreciation have a bearing on the matter of leasing, since these charges have made it possible to accelerate tax-write-offs during the early years of the life of the equipment, thus taking some of the tax benefits from leasing.

However, according to Mr. Campbell, leasing too, can be arranged for accelerated payments in the early stages with correspondingly lower payments as the term of the lease continues. Still another point affecting write-off of equipment is the fact that the term of the lease is often far shorter than the expected life of the equipment based on Federal depreciation rates, thus permitting faster write-offs than even the accelerated depreciation schedules. It is therefore necessary for each individual company considering leasing, to weigh the advantages of the various possibilities.

Mackintosh-Hemphill Now Bliss Division

Approximately 91 per cent of the shares of Mackintosh-Hemphill Co., Pittsburgh, were voted in favor of selling the company to the E. W. Bliss Co., Canton, Ohio, last month. Mackintosh-Hemphill, therefore, is now a division of Bliss, but it will still operate its current plants. The sale was transacted on the basis of nine shares of Bliss common for 10 shares of Mackintosh common. The consolidation unites a producer of rolling mills and a maker of rolls.

Axelson Gets Fray Line

Axelson Manufacturing Co., a division of U. S. Industries, Inc., Los Angeles, just bought the complete Fray line of milling machines and milling attachments from the Fray Machine Tool Co., Burbank. The line will continue to be produced at the same plant.

Borides to Be Investigated

The ASTE Research Fund is underwriting a research study on the use of borides for cutting tools. Armour Research Foundation will handle the actual investigation of cemented boride composites and the cutting tests performed with borides. One of the things which makes the study particularly interesting is that borides are relatively inexpensive and are in plentiful supply.

C-Frame, an H-P-M Line

Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is currently featuring a line of C-frame presses in 11 sizes. Ranging from two to 200 tons, all models are fully adjustable up to maximum capacity. Along with H-P-M practice, all power units are mounted within the frame and a high speed differential circuit is standard for production runs.

Ren•ite PLASTIC TOOLING NEEDED TO COMPETE TODAY

TAKE THE CASE OF THIS AUTOMOTIVE BODY WITH MASTER KELLER MODELS IN CUBED POSITION.

TOOLING TIME CUT AS HIGH AS 70%

Here is definite proof of Ren-ite Plastic Tooling doing a job better in the automotive field. This builder of fine cars has accepted the challenge of higher production rate at lower production costs. Savings in tooling costs plus faster checking operations have helped in holding the price line on this 1955 car.

Check Your Tooling Costs
Investigate Ren-ite Plastic
for the LOW COST ANSWER

Ren-ite is the dimensionally-stable tooling plastic of Thermo-setting Resin used as a laminating or casting plastic without application of heat or pressure. Hundreds of uses have been found . . . Keller models . . . duplicators . . . spotting racks . . . draw dies . . . drop hammer dies . . . core boxes . . . drill fixtures and new ones are developing each day.

Ren•ite PLASTICS, INC.

FREE ENGINEERING SERVICE
NO CONTRACT REQUIRED

3189 South Cedar Road, Lansing 4, Michigan
Offices in Chicago, Cleveland, Detroit,
Los Angeles, New York and St. Louis

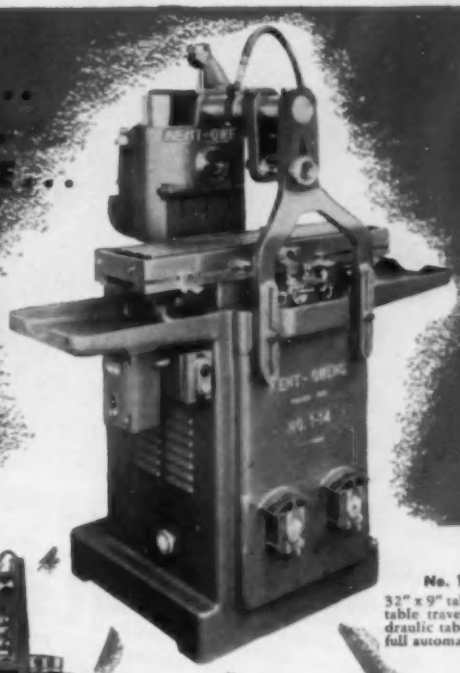
AUTOMOTIVE INDUSTRIES . . .

Is your News Magazine of Automotive and Aviation

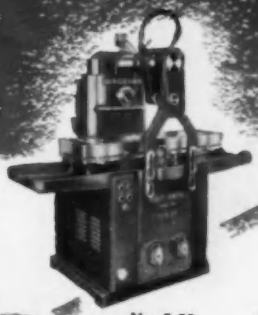
MANUFACTURING

EXTRA RUGGED... SPEEDY... ACCURATE...

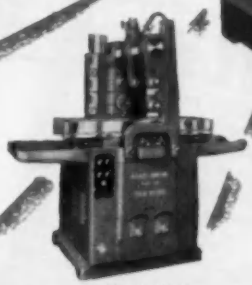
to Bring Down Milling Costs!



No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.



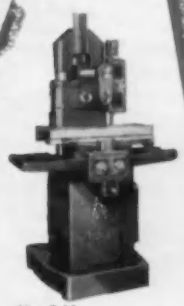
No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.



No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.

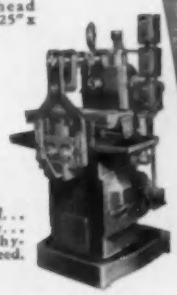
No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 1-V
Hydraulic vertical head feed ... 5½" head travel ... 25" x 9" table.

No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.



No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference . . . greater dependability . . . accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

KENT-OWENS REPRESENTATIVES

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General Machinery Corp.

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Don W. Paterson

CHICAGO
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Hauser Machine Tool Co.

DAYTON
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DETROIT
A. C. Habenstein Mach'y Co.

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MILWAUKEE
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MINNEAPOLIS
The Interior Company

MOLINE
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MONTREAL
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NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Harrington & Richardson Company

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Cahn Machinery Company

PITTSBURGH
Barnes Machinery Company

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WINDSOR, ONT.
F. F. Barber Mach'y Company

GOOD RULE TO FOLLOW
WHEN BUYING
ANY SPECIALIZED MACHINE:
CHOOSE A MAKE WHOSE BUILDER THINKS
ENOUGH OF HIS OWN GOOD NAME TO
EQUIP HIS PRODUCT WITH
•CONTINENTAL RED SEAL POWER•
Within Continental's range, from two to 1,100-horsepower, it would be hard to name a type of engine-driven product—vehicle, aircraft, boat, or industrial machine—of which one or more of the leading makes do not rely today on Continental power. As might be assumed from the current trend toward greater specialization, the list of such applications is longer than ever before. The field of Red Seal usefulness has broadened to the point where—as this list suggests—there is almost no end to the industrial uses of dependable Continental power.
Air Compressors • Air Conditioners • Backfillers • Balers • Ballast Packers • Batching Plants • Binders • Blowers • Bulldozers • Choppers • Cement Cutters • Concrete Finishers • Concrete Mixers and Pavers • Conveyors • Cranes • Crash Trucks • Crop Dusters • Derricks • Ditchers • Drag Lines • Drill Rigs • Earth Borers • Earth Movers • Electric Welders • Elevators • Ensilage Cutters • Excavators • Fog Generators • Gathering Pumps • Graders • Hay Loaders • Heavy Engine Starters • High Lifts • Hoists • Ice Machinery • Industrial Tractors • Irrigation Pumps • Loaders • Lumber Carriers • Materials Handlers • Mud Pumps • Oil Field Machinery • Pipe Benders • Portable Generators • Rollers • Rock Crushers • Separators • Shovels • Sprayers • Street Flushers • Street Sweepers • Transit Mixers • Vibrators • Warehouse Trucks • Winches
CONTINENTAL MOTORS
Powerful as the Nation
AMERICA'S STANDARD

SERVICE FACILITIES AND GENUINE RED SEAL PARTS ARE AVAILABLE EVERYWHERE

6 EAST 45TH ST., NEW YORK 17, N. Y. • 6216 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3017 S. SANTA FE AVE., LOS ANGELES 58, CALIF. • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA. • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Continental Motors Corporation
MUSKEGON, MICHIGAN

CALENDAR

OF COMING SHOWS AND MEETINGS

Sixth National Materials Handling Exposition, International Amphitheater, Chicago, Ill. ...May 16-20
American Society for Quality Control, ninth annual convention, Hotels Statler and New Yorker, New York, N. Y. .....May 23-25
AMA Top Management Conference, Hotel Roosevelt, New York, N. Y. .....May 23-25
International Internal Combustion Engine Congress, The Hague, Netherlands .....May 23-28
Indianapolis Race, Indianapolis, Ind. May 30
Canadian International Trade Fair, Toronto, Ont. .....May 30-June 10
Canadian International Air Show, Toronto, Ont. .....June 4-5
American Welding Society, spring meeting, Hotel Muehlebach, Kansas City, Mo. .....June 7-10
Paris Aeronautical Show, France June 10-19
Le Mans 24-Hr Race, France..June 11-12
SAE Golden Anniversary Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J...June 12-17
Technical Conference and Exhibit on Magnetism, William Penn Hotel, Pittsburgh, Pa.....June 14-16
ASME Semi-Annual Meeting, Hotel Statler, Boston, Mass. ....June 20-23
ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 26-July 1
American Nuclear Society, first annual meeting, Penna. State Univ., State College, Pa....June 27-29
Western Plant Maintenance and Engineering Show, Pan Pacific Auditorium, Los Angeles, Calif. July 12-14
SAE Golden Anniversary West Coast Meeting, Hotel Multnomah, Portland, Ore. .....Aug. 15-17
NICB Symposium on Electronics and Automatic Production, San Francisco, Calif. .....Aug. 22-23
Western Electronic Show and Convention, Civic Auditorium and Fairmont Hotel, San Francisco, Calif. .....Aug. 24-26
National Aircraft Show, International Airport, Phila., Pa. ...Sept. 3-5
Farnborough Air Show, England Sept. 5-11
Paris Automobile Show, France Sept. 6-16
NMTBA Machine Tool Show, International Amphitheater, Chicago, Ill. .....Sept. 6-17
Production Engineering Show, Navy Pier, Chicago, Ill. .....Sept. 6-17
Coliseum Machinery Show, Chicago, Ill. .....Sept. 6-17
SAE Golden Anniversary Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. .....Sept. 12-15
Instrument Society of America, 10th annual Instrument-Automation Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. .....Sept. 12-16
National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. .....Sept. 14-16
National Industrial Packaging and Materials Handling Show, Kingsbridge Armory, New York, N. Y. Sept. 20-22
First Trade Fair of the Atomic Industry, Sheraton-Park Hotel, Washington, D. C. .....Sept. 26-30

80 million
is a lot of
Sealed Power
SEALING RINGS

That's well over half of all the sealing rings that have ever been made—because Sealed Power is far and away the largest manufacturer of rings for automatic transmission and power steering.

It all began away back before World War II, when tanks needed sealing rings. Sealed Power, with its long experience and fine engineering staff and laboratory facilities, was the natural source of supply. That was seventeen years ago.

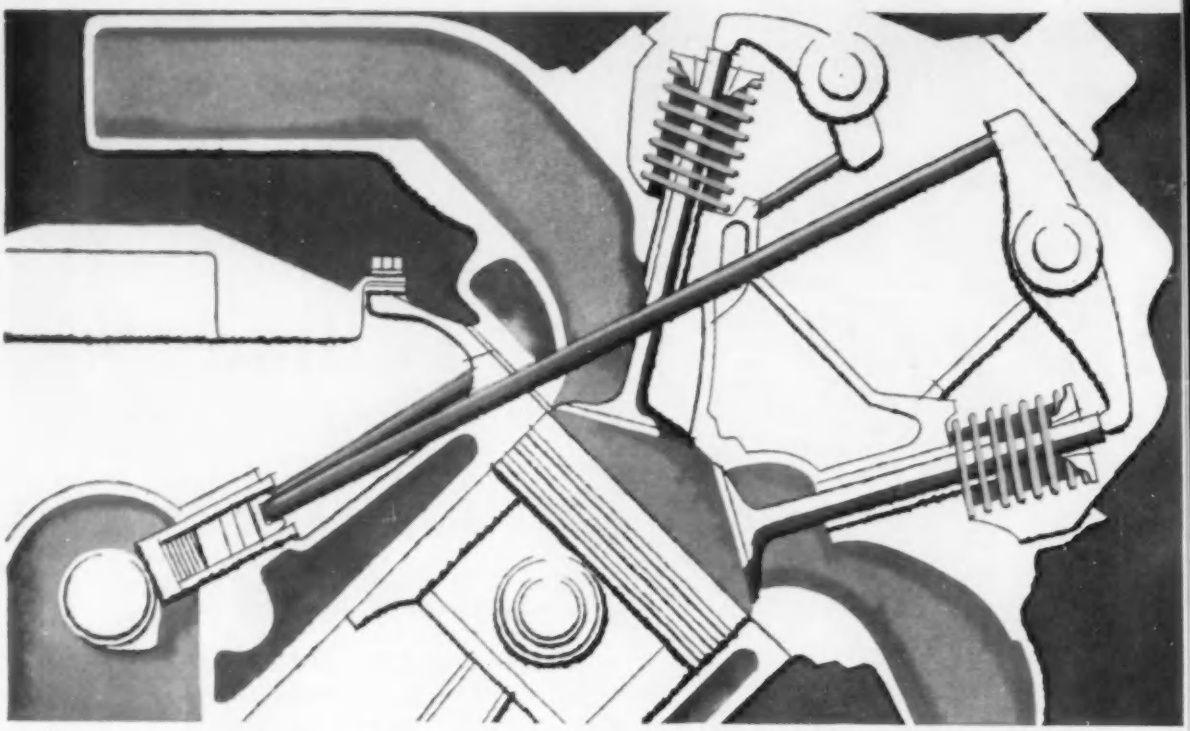
Now Sealed Power makes sealing rings for passenger cars, trucks, buses—and, of course, for tanks. Sixteen of the nineteen makes of cars now using automatic transmissions use Sealed Power sealing rings.

Sealed Power is best qualified to help you solve your own sealing ring problem. Your inquiry will receive prompt attention.

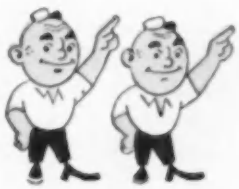
Sealed Power Corporation

MUSKEGON, MICHIGAN

Sealed Power Chrome Piston Rings are used by 28 leading engine builders!



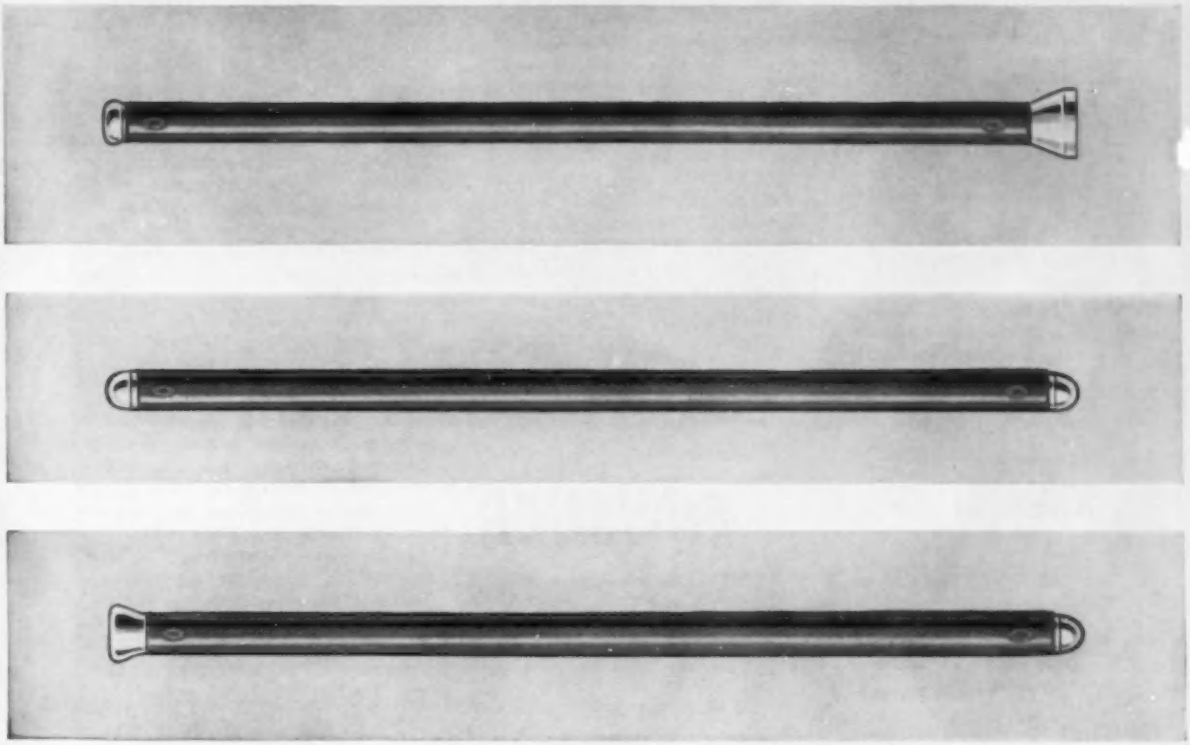
Today's sharp swing toward higher horsepower overhead-type engines for passenger cars has resulted in a steadily growing demand for push rods of Bundyweld, long proved in truck and automobile engines. Let us show you how we can help with your push-rod problem.



How Bundyweld push rods help improve performance of overhead-type engines

WHY BUNDYWELD IS BETTER TUBING
Bundyweld starts as a single strip of copper-coated steel. Then it's . . .
continuously rolled twice around laterally into a tube of uniform thickness, and
passed through a furnace. Copper coating fuses with steel. Result . . .
SIZES UP TO 1/8 O.D.
Bundyweld, double-walled and brazed through 360° of wall contact.
SIZES UP TO 1/8" O.D.

← **NOTE** the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.



2 Tough, lightweight push rods of hardened Bundyweld reduce cam load; increase efficient function of entire valve train. Bundyweld fabricates more easily than the material it replaces; results in more uniform, better finished parts. End inserts are easily spot welded to tubing.

Long used in many passenger-car and truck engines, lightweight push rods of Bundyweld have helped design engineers produce more powerful overhead-type engines.

These tough push rods reduce load on cam, and, of course, the entire valve train follows the cam more closely. The design engineer is thus able to produce a more efficient, more powerful overhead engine, in keeping with today's constantly growing trend.

The tubing: Bundyweld is the only tubing double-walled from a single metal strip, with patented beveled edges. It's SAE 1010 steel, copper-bonded throughout 360° of wall contact into a strong, lightweight, beadless tubing. Wall thickness and concentricity are uniform, accurate. Ultimate tensile strength, yield strength, and fatigue limit are exceptionally high.

Engineering help: If you'd like help in determining how to apply Bundyweld toward solving your push rod problems, why not talk things over with one of our experienced automotive tubing engineers? You'll find them a prime source of sound information and ideas – not only on push rods but on all other automotive tubing applications.

Production: We're already turning out quantities of tubing for automotive push rods. And, naturally, we're ready to give you the same high-volume, low-cost service we're giving others. We'll ship Bundyweld – cold drawn to proper hardness, held to specified low camber tolerances—right on schedule.

Let us show you what we've done – and what we can do for you – with push rods of Bundyweld Tubing. Perhaps you'd like to check into Bundyweld for your gasoline, oil, hydraulic window or brake lines, too. For details, write Bundy Tubing Company, world's largest producer of small-diameter tubing.

BUNDY TUBING COMPANY • DETROIT 14, MICHIGAN

BUNDYWELD TUBING.

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • ***Chattanooga 2, Tenn.:*** Pairson-Deakins Co., 823-824 Chattanooga Bank Bldg. • ***Chicago 32, Ill.:*** Lapham-Hickey Co., 3333 W. 47th Place • ***Elizabeth, New Jersey:*** A. B. Murray Co., Inc., Post Office Box 476 • ***Los Angeles 58, Calif.:*** Tubesales, 5400 Alcoa Ave. • ***Philadelphia 3, Penn.:*** Rutan & Co., 1717 Sansom St. • ***San Francisco 10, Calif.:*** Pacific Metals Co., Ltd., 3100 19th St. • ***Seattle 4, Wash.:*** Eagle Metals Co., 4755 First Ave., South ***Toronto 5, Ontario, Canada:*** Alloy Metal Sales, Ltd., 181 Fleet St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

The BUSINESS PULSE

(*Continued from page* 108)

whether the slightly less favorable experience is likely to develop into a trend. For the time being, the high level of over-all expenditures seems more significant.

Evidence that trade activity is generally keeping abreast of production is provided by inventory data. Despite the substantial rise in output since last fall, statistics do not reveal any significant generalized growth of business stocks. At least that was true through February, the latest month for which comprehensive data are available. On a seasonally adjusted basis, total business inventories stood at $77.7 billion at the end of February, only $400 million, or ½ per cent, above their recessionary low. Manufacturers' inventories actually showed no increase at all through February, the increase in total inventories being accounted for wholly at the retailer and wholesaler levels. Since a part of the rise in trade inventories — perhaps the greater part — was due to the increase in dealers' stocks of new cars, there seems a good likelihood that liquidation of inventories was still in progress in some areas as late as February. Some information points to inventory accumulation in individual industries in March and April, but there is certainly no evidence as yet that pipelines are becoming clogged. This is one of the most encouraging aspects of the present business situation.

Labor Market Improves

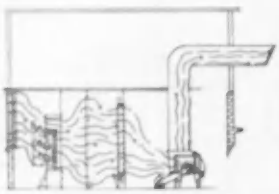
The improvement in the labor market since last autumn has not been fully commensurate with the advance of output, but the gains which have been registered are by no means inconsiderable. On a seasonally adjusted basis, unemployment is now appreciably below the levels which obtained immediately before the beginnings of the business upturn. In March the number of jobless was estimated at 3.2 million, 200,000 below the February total and 500,000 less than in March, 1954. There seems a good chance of further improvement in April and May statistics, inasmuch as a recent survey of employer hiring plans for the spring months undertaken by the Department of Labor was generally favorable. Moreover, the latest information on the labor market is encouraging in that it reveals a continued upward tendency in the length of the factory work week.

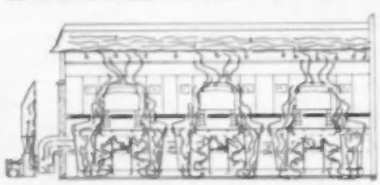
There are encouraging indications that the expansion of activity is inducing businessmen to step up investment expenditures. This phenomenon, which professional economists have aptly characterized as "acceleration," is one of the outstanding factors in the present situation which augurs well for the future. Last fall there was every indication that plant and equipment expenditures would continue on the downgrade throughout 1955. Last month, therefore, when a Government survey of investment intentions pointed to a gain of about one per cent in all types of investment outlay this year as compared with 1954, a good deal of optimism was engendered.

1955 May Be Best Year

Manifestations of rising optimism with regard to general business prospects for the second half of the year are evident on many fronts. The stock market, for example, has been very strong in recent weeks,

PD Another Problem...FINISHED





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PETERS-DALTON are exclusively contract manufacturers. Knowing this, a major automobile company called upon us to meet its special requirements. This manufacturer wanted a Finishing System installed, of a type comparatively unknown to industry. It requires this system for maintenance of its own high standards of product finish. The installation by PETERS-DALTON now assures this company of delivery of its automobiles with 100 per cent perfect finishes. The Finishing System receives automobiles after leaving final assembly. The cars move through the upper level of the system on conveyors where any necessary repainting or touchup is made. Cleaning of paint-laden exhaust air is done by equipment in the basement level . . . heating and cleaning of supply air is completed outside the building.

Whether you require such a complicated system or one of a basically simple nature, depend on the more than quarter century of PETERS-DALTON engineering experience. We are ready and able to meet your needs — meet them with economy to you of time and costs — and on an individual basis. Find out for yourself — just write, wire or phone.

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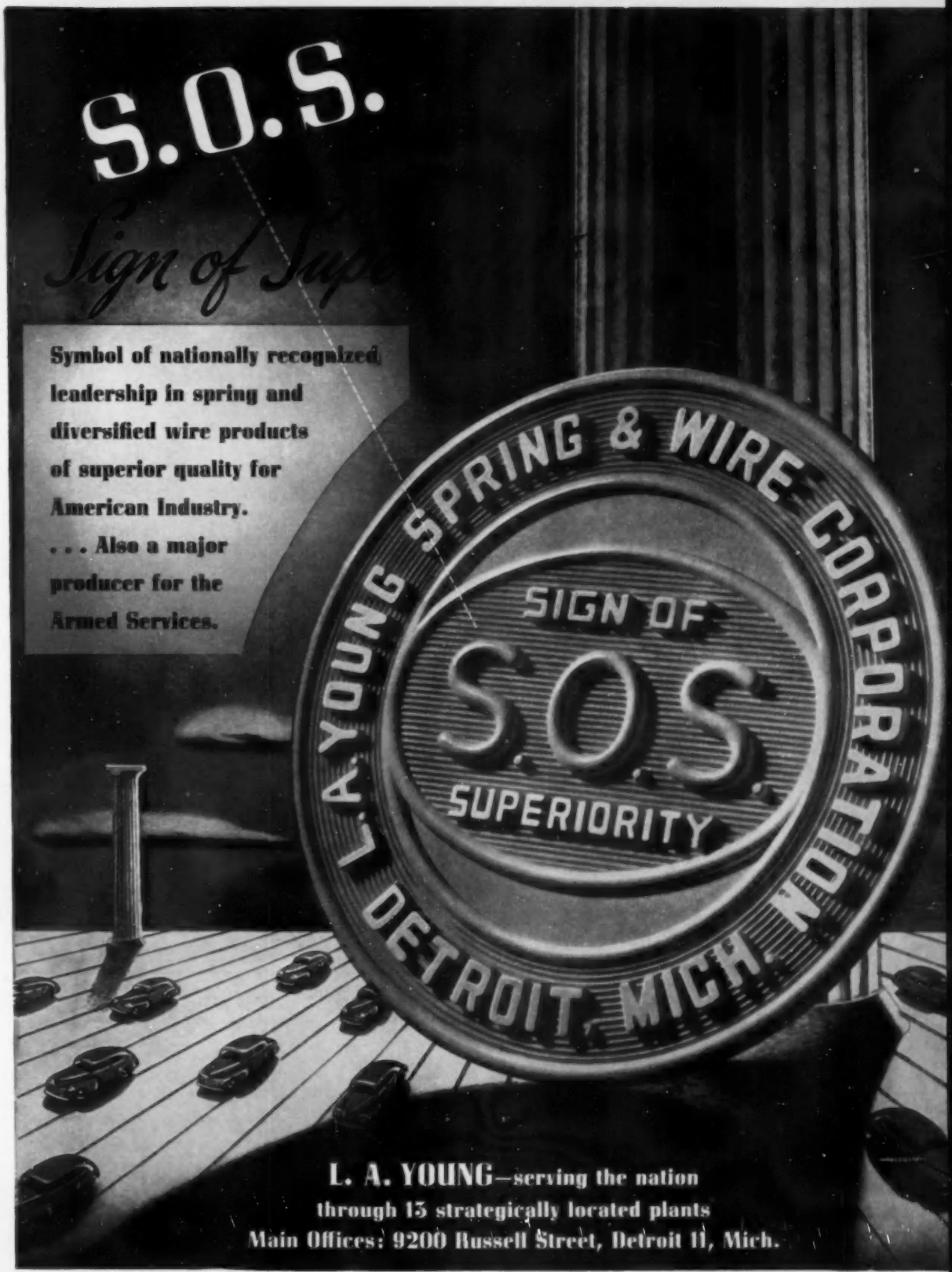
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FOR **EXTRA PROTECTION**

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HD-20 Oil Control Ring

Sealed Power Engineered Piston Ring sets feature protective Granoseal Finish, which prevents scuffing and reduces friction 60%, by actual laboratory tests.

Actually, Granoseal Finish is a non-metallic manganese iron crystalline phosphate finish produced by surface conversion of the piston rings in the "Thermoil-Granodine" chemical bath.

Granoseal crystals absorb and retain oil, giving continuous protection during the critical mating or breaking-in period. Granoseal Finish is corrosion-resistant and rustproof. It expedites the normal seating of rings.

Thermoil-Granodizing thus adds thousands of miles to Sealed Power piston ring life and, since it eliminates abnormal wear, scuffing and cylinder scoring, is an invaluable aid to long ring life and satisfaction.

TF-30 Compression Ring

RT-40 Oil Control Ring

RT-20 Oil Control Ring

HD-40 Oil Control Ring

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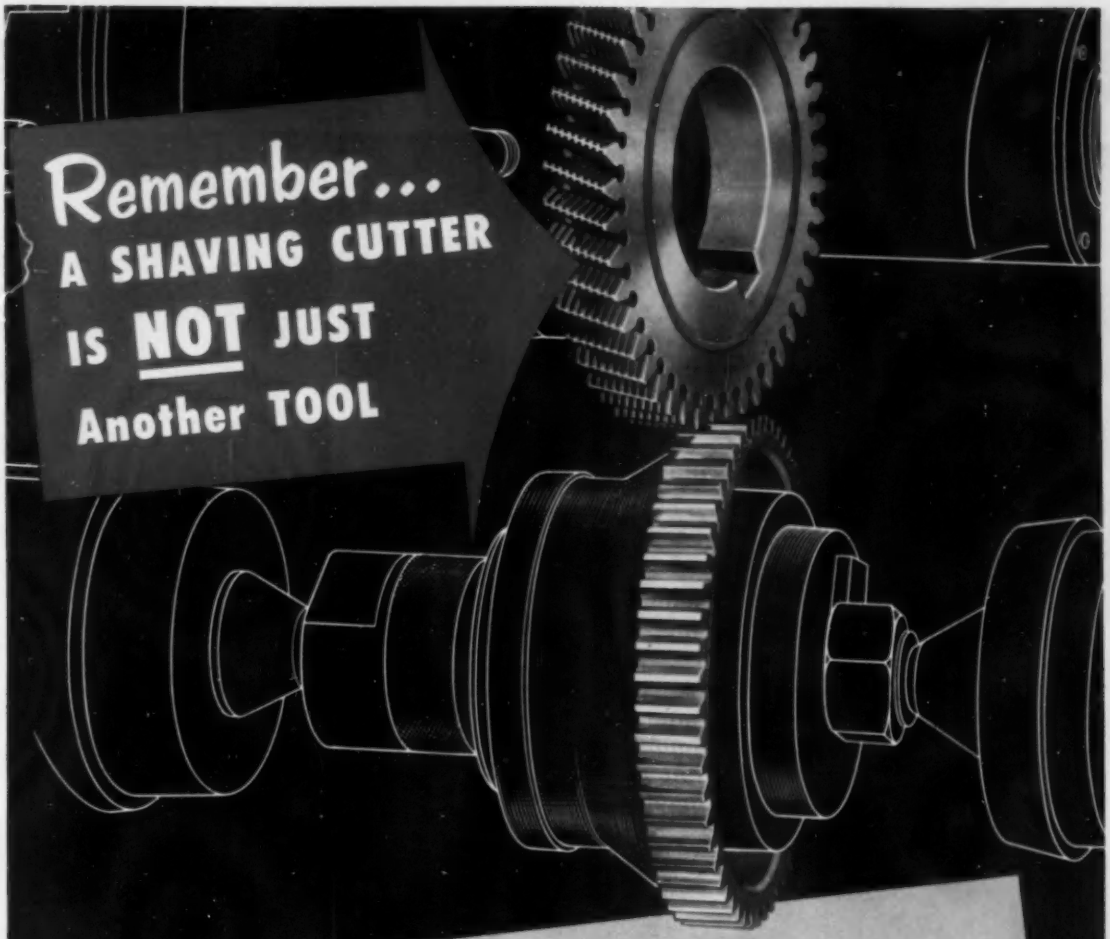
and the setback experienced during the period of the Fulbright investigation has been more than made up. Indeed, the stock market showed so much vigor through early April that the Federal Reserve Board increased margin requirements from 6 per cent to 70 per cent. Commerce Secretary Sinclair Weeks recently commented that he believes there is a good chance that 1955 will go down as the best year in our history, exceeding the 1953 record. In doing so, he stressed the broadly based nature of the business expansion and the momentum which has already been achieved.

More and more people are undoubtedly coming to share Mr. Weeks' optimistic assessment of prospects for 1955 as a whole. The factor of momentum does seem to strengthen the grounds for optimism for this calendar year, for though automobile output is still thought likely to decline in the second half, it may take considerable time for the effects of any cutback in that area to have widespread effects. It is well to remember, however, there is no real evidence that momentum itself can basically alter a cyclical movement, although it can undoubtedly affect it temporarily. General economic indicators may very well average out at high levels in the latter months of the year because of the directional force being created now, but this will be of little help, and could even be unfortunate, over the longer term if, as some people fear, resources are now being improperly allocated. In other words, the outlook beyond the next few months does not depend so much on the existence of momentum as on how well balanced the present recovery is.

BOOKS . . .

TITANIUM IN IRON AND STEEL, *by George F. Comstock, published by John Wiley & Son, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $6.00.* This book critically reviews and correlates all the important data in world literature on titanium as an alloying element in iron and steel. Nearly 300 papers (listed in the bibliography at the end of the book) were reviewed for the manuscript. Opening with a general discussion of titanium and its minerals—principal sources, concentration, preparation, etc.—the book goes on to examine the properties and effects of the element as an addition to cast iron and steel. Its deoxidizing effects are discussed in full. Special emphasis is placed on its unique effects in stabilizing nitrogen and in fixing carbon in alloys where other carbides may be undesirable, on its usefulness in steel which is to be enamelled, and in certain complex ferrous alloys for high-temperature application.



Remember... A SHAVING CUTTER IS NOT JUST Another TOOL

EXPERIENCE

Making the successful rotary gear shaving cutter requires not only the consummate skill of the master toolmaker, but also a thorough knowledge of gear practice. The latter is acquired only the hard way, by experience — a lot of it.

No group anywhere has had as much cutter experience as Red Ring engineers who developed Rotary Gear Shaving. They have been learning more and more about cutters for the last 25 years — and still are.

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It would be convenient indeed if all cutters could be made to a standard design, interpolating only for variations in basic gear characteristics.

Unfortunately, there are many variables which often make modifications essential. But, how much modification? Where to apply it? The answer again is EXPERIENCE with the performance data to substantiate it.

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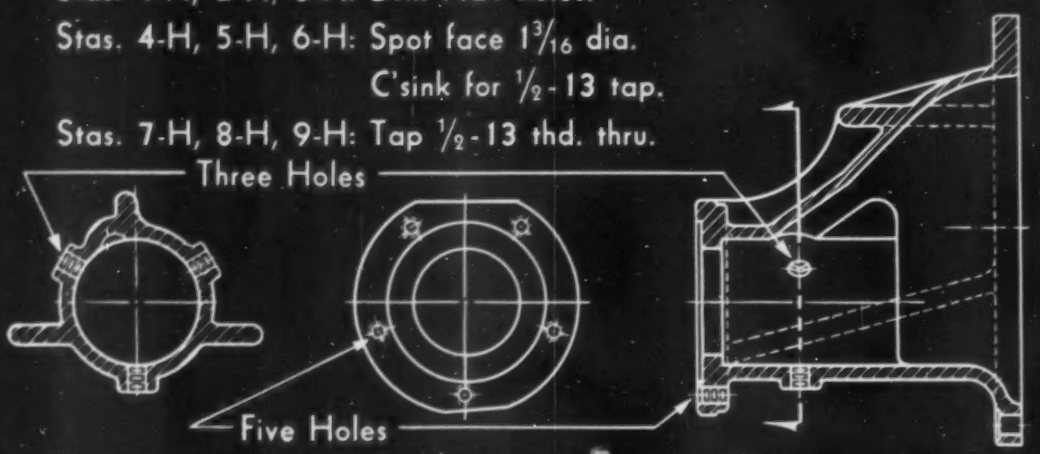
240 pieces per hour gross. 24 operations. 8¢ per piece.

Stas. 1-H, 2-H, 3-H: Drill .421 holes.

Stas. 4-H, 5-H, 6-H: Spot face $1\frac{3}{16}$ dia.
C'sink for $\frac{1}{2}$-13 tap.

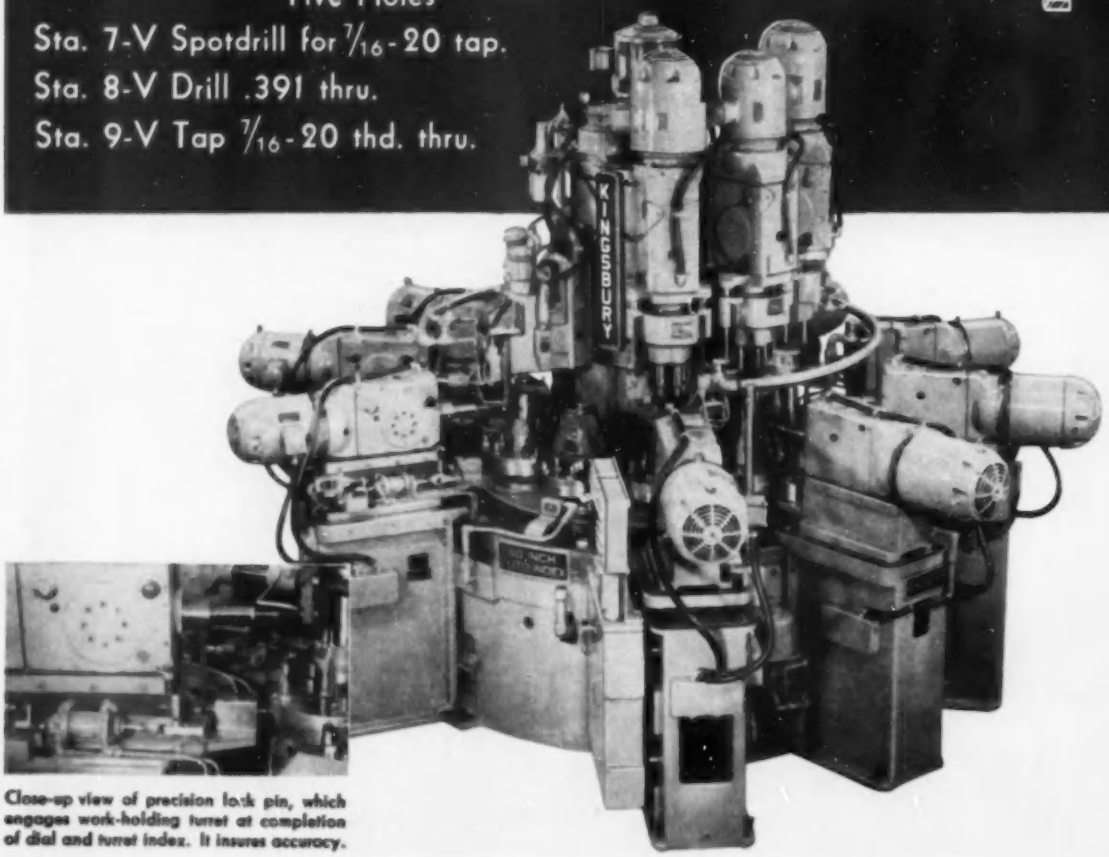
Stas. 7-H, 8-H, 9-H: Tap $\frac{1}{2}$-13 thd. thru.



Sta. 7-V Spotdrill for $\frac{7}{16}$-20 tap.

Sta. 8-V Drill .391 thru.

Sta. 9-V Tap $\frac{7}{16}$-20 thd. thru.



Close-up view of precision lock pin, which engages work-holding turret at completion of dial and turret index. It insures accuracy.

can mean uniform parts at low cost for you

The Malleable Iron Differential Carrier (at left) calls for eight tapped holes. The five vertical holes require three operations, and present no special problem. But . . . the three horizontal holes also require three operations each — and these holes are spaced 120° apart.

A central column machine is used. It has a 60-inch index table with ten stations (one for loading and unloading). Each of the work-holding fixtures is mounted on a rotating turret which turns 120° as the table indexes. For accuracy, the turret is locked in position as shown in the detail photograph. Work is clamped onto the fixture at each work station.

The Cast Iron Manifold Heat Control Assembly (below) calls for precision machining *and an assembly operation.* This work is *all* accomplished in one production cycle on machine illustrated. The table indexes through five stations (one for loading and unloading). Operations are performed by four horizontal units. At Stations 1, 2 and 3 the hole is drilled, countersunk and reamed. At Station 4 the pins (fed into a chute and released by an escape mechanism) are pressed into the prepared hole by a specially-designed hydraulic ram.

Machines *designed and built* by Kingsbury use work-tested Kingsbury units such as heads, index mechanisms, cutting tool guides, synchronized controls, bases, etc. *But the work-holding fixtures are special — designed for each part.* They have to be, for unless the part can be located correctly and held firmly, required *accuracy* cannot be obtained. And unless the fixtures can be loaded and unloaded quickly and easily, *production* will suffer.

It's a job that requires specialized skills and experience. *We have both.*

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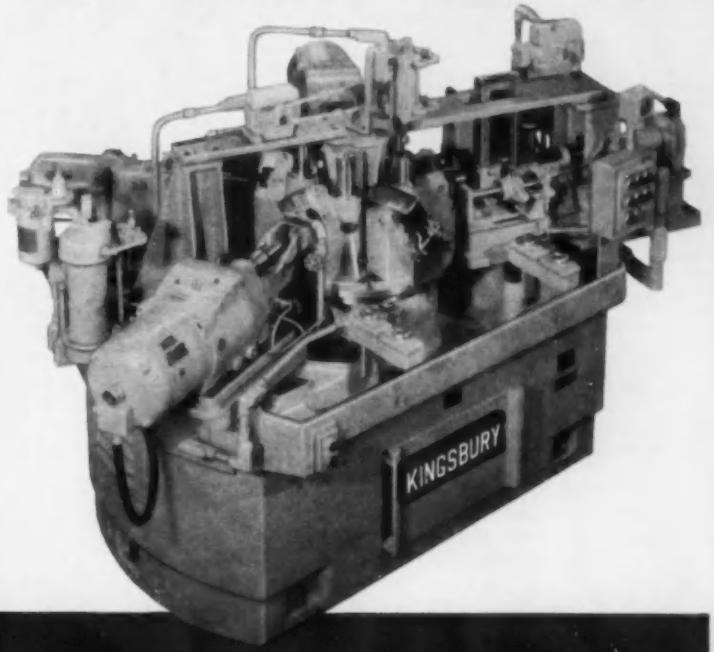

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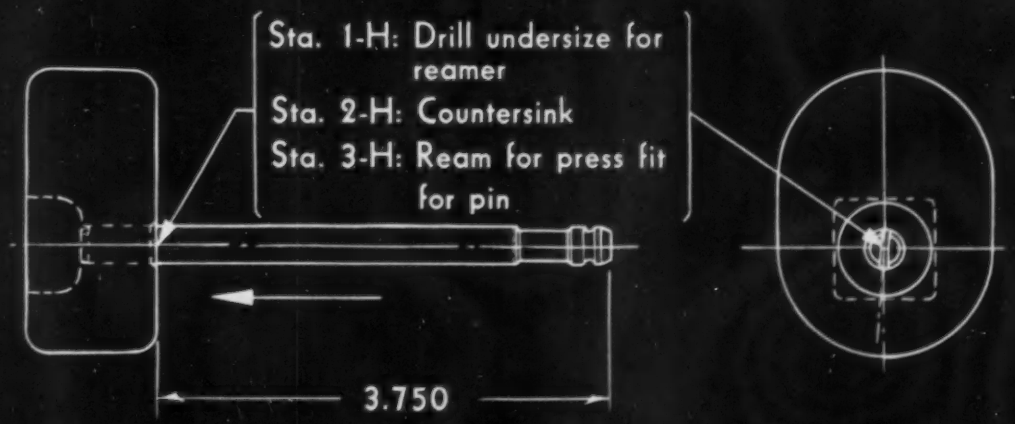
CAST IRON MANIFOLD HEAT CONTROL ASSEMBLY

300 pieces per hour gross. Four operations. $2\frac{2}{10}$¢ per part.



Sta. 4-H. Press pin in place with hydraulic ram assembly.

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A variety of machining operations, unique in sequence, is combined on a new 15-station automatic transfer machine. Grouping standard machine tool units attains maximum production and utilizes automation. In addition, the M. & M. Triple-Chip circular saw cut-off makes possible the use of low cost stock material; increases your ultimate savings. Start by sending us your part drawings for a production solution by Motch & Merryweather.

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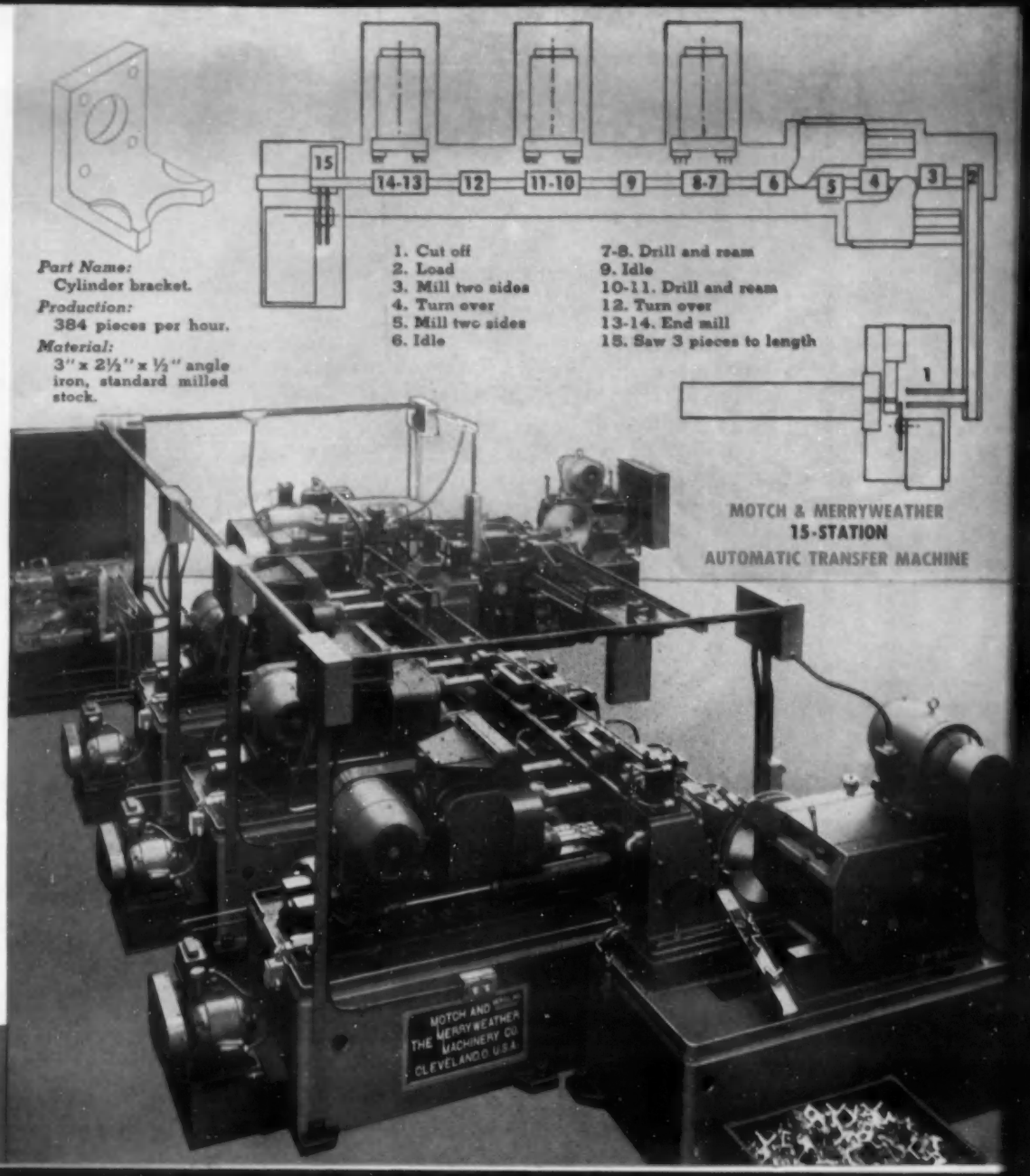

Free LITERATURE

(*Continued from page* 102)

Blind Rivets 26

Booklet TL-99 describes how commercial blind rivets are installed by one man from one side of the work without any buckling, hammering, twisting or exploding. They are set by a special gun which pulls the stem into the hollow shank, upsets a head on the blind side, and fills the hole in the work. *Townsend Co.*

Horizontal Machine 27

A new catalog on horizontal boring, drilling and milling machines lists specifications and construction illustrations on four-in. spindle diameter machines, special attachments and controls. *The Portage Machine Co.*

Ferrous Castings 28

Folder No. 14 has the objective of pointing out the possibilities of effecting cost savings without sacrifice of quality by using iron and steel castings. *Belle City Malleable Iron Co., Racine Steel Castings Co.*

Two-Point Control 29

Bulletin F 5345-1 describes the Millivoltmeter plug-in type Multronic Capacitrols. These instruments incorporate dual "Electronic Control" circuits which operate in harmony, but independent of each other, to control the process variable at two different points. Typical applications would include control of two separate fuel systems or furnaces, and those applications making use of on-off control plus automatic fuel shut-off. *Barber-Colman Co., Wheelco Instruments Div.*

Rubber Abrasives 30

A catalog just issued lists a line of rubber-cushioned abrasives, accessory products which are available in many sizes of either aluminum exide or silicon carbide grains, in combination with soft, firm or tough rubber binders. *Brightboy Industrial Div., Weldon Roberts Rubber Co.*

(*Turn to page* 150, *please*)

9 TIMES MORE PAINT MILEAGE ON AUTOMOBILE CHASSIS!
STUDEBAKER
gets a better, more uniform, paint job on chassis as production is increased and finishing costs are cut substantially with
RANSBURG NO. 2 PROCESS Electrostatic Spray Painting*

● When Studebaker Division, Studebaker-Packard Corporation switched to Ransburg No. 2 Process of Electrostatic Spray painting on their automobile chassis, paint mileage was increased 9 times.

By simply putting the paint where it's supposed to go, Studebaker cut daily paint consumption on the chassis production line from 14½ drums to 1½ drums. And, still they are painting 6 more chassis per hour with the No. 2 Process.

In addition to getting better, more uniform coverage with the asphalt-type coating, paint and labor costs were cut 70¢ per chassis. In eliminating the former set-up with 2 water wash booths and 12 automatic spray guns, they save nearly 1000 square feet of badly needed floor space.

Another on-the-job-example of the unmatched efficiency of the Ransburg No. 2 Process in which quality of the work is improved . . . AT LESS COST!

* *Studebaker also uses the Ransburg method to apply a heavier and more uniform primer surfacer on automobile bodies.*

Whatever your product—large or small—if your production justifies conveyorized painting, it's possible that one of the Ransburg electrostatic processes can do the job better, with substantial savings to you. We'll be glad to tell you about complete Ransburg services.

Write Dept. A

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Lessens Driving Fatigue!

Dampens Vibration!

Lengthens Truck and Parts Life!

Deadens Noise!

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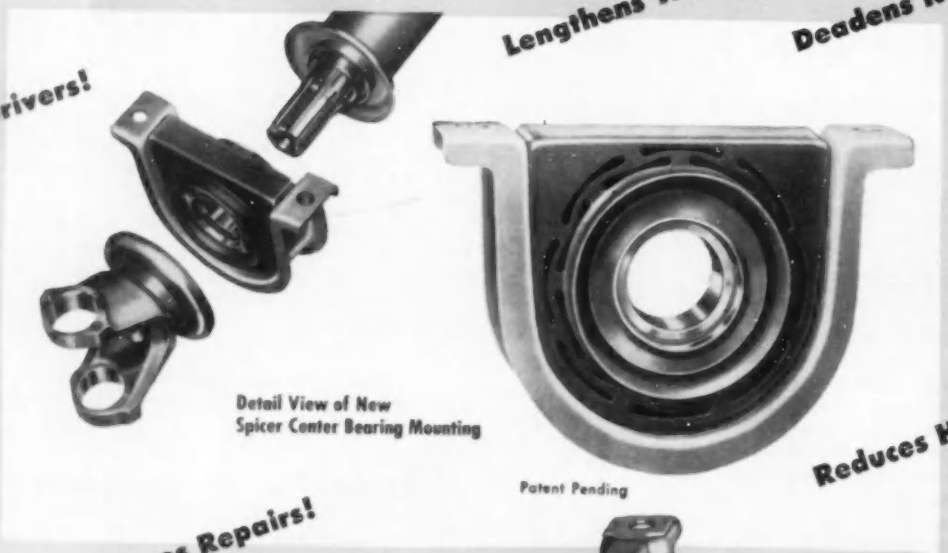
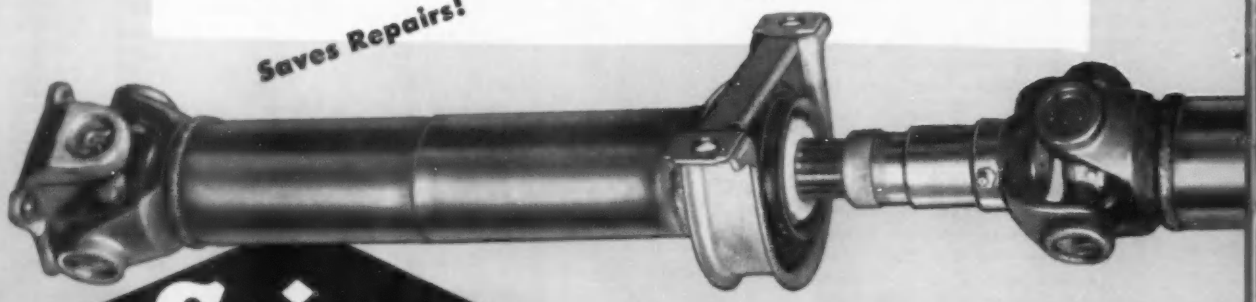


Detail View of New
Spicer Center Bearing Mounting

Patent Pending

Reduces Hum!

Saves Repairs!



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CENTER BEARING MOUNTING

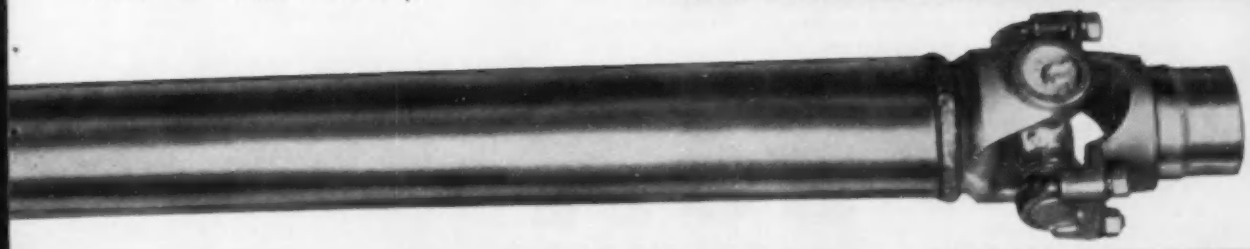
the top 5 Truck Producers!

In the merciless testing of new developments for the automotive industry, the new Spicer Center Bearing Mounting has emerged with outstanding records of performance

. . . and quick acceptance as standard equipment on leading makes of trucks!

This new Spicer mounting for propeller shafts is an exceptional engineering advancement. It embodies a revolutionary combination of ball bearing and low-frequency rubber. This achieves remarkably low vibration transmissibility at driving speeds. It dampens . . . deadens . . . absorbs nearly all the vibration disturbances transmitted to it from the drive line.

The Spicer Center Bearing Mounting is available for original truck equipment, as an integral part of the Spicer Propeller Shaft assembly. It is another Spicer engineering "first," typical of Spicer pioneering that has been dedicated to the advancement of the automotive industry.



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Free LITERATURE

(*Continued from page* 147)

Colloidal Graphite 31

Revised bulletin No. 435 describes how electric-furnace graphite of high purity, when processed to colloidal size and dispersed in a suitable carrier, is used effectively as a surface coating for many mechanical devices. *Acheson Colloids Co., Div. of Acheson Industries, Inc.*

Shell Molding 32

A fully integrated, automatic shell molding system capable of producing up to 240 quality molds per hour is described in book No. 2462. This system includes a four-station shell molding machine for forming and curing mold-halves; a shell closing machine for completing the shell-molding operation; and all process equipment from sand preparation to handling of finished castings. *Link-Belt Co.*

Drills and Reamers 33

The fifth edition of 36-page "Drill and Reamer Facts" describes and illustrates the design and construction of HSS and carbide-tipped twist drills, and reamers, correct drill pointing, as well as general instructions in the proper use and care of drills. Recommended speeds and feeds, cutting compounds and types of drill point to use when drilling various materials are also given. Several tables are included. *Whitman & Barnes.*

Spray Painting 34

Nearly 200 pieces of spray painting equipment used in the automotive field, including a nozzle selection chart, are illustrated in catalog No. 105, recently issued by the *Binks Manufacturing Co.*

Die Casting 35

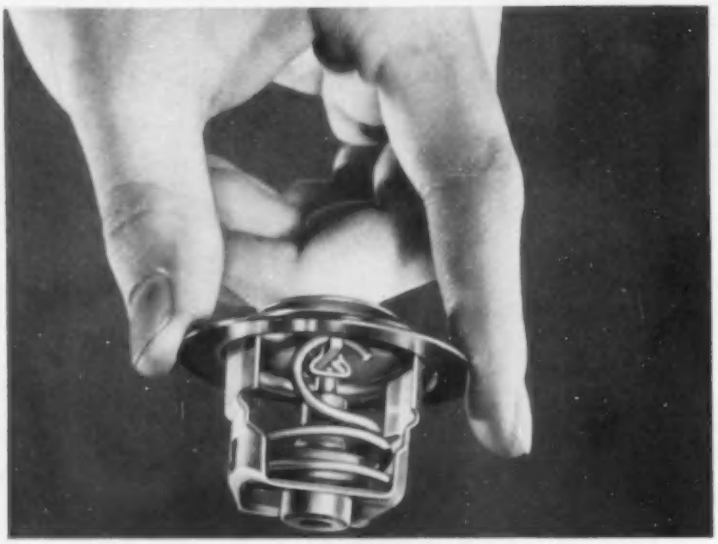
First five of a series of Engineering Product Standards for Die Castings are now available, covering linear dimension tolerances, parting line tolerances, moving die part tolerances, draft requirements for walls, and flatness tolerances. Obtain names of nearest member job shops from *American Die Casting Institute.*

Electric Trucks 36

Modern Material Handling, a 32-page publication, has just been extensively revised to include up-to-date illustrations of modern industrial trucks with the latest material-handling attachments. The publication is devoted to the unit-load principle, the power requirements of industrial trucks and the characteristics of nickel-iron-alkaline storage batteries. *Edison Storage Battery, Div. of Thomas A. Edison, Inc.*

Zinc Coatings

A new booklet describes the zinc phosphating materials used in the CrysCoat Process to give paint-anchoring, corrosion-resisting coatings that usually weigh more than 200 milligrams per sq ft of surface. Write on company letterhead to *Oakite Products, Inc., 128-A Rector St., New York 6, N. Y.*



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Highly developed for positive operation against the increased pump pressures in sealed cooling systems, and with all types of antifreeze solutions. Helps maintain best engine performance —speeds warm-up—saves gasoline and oil—reduces wear. Gets more heat from the car heater.

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ALL WAYS!

The batteries that "spark" fast take-offs for emergency vehicles . . . that provide the "muscles" to start heavy machinery . . . also serve best in today's autos and trucks.

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The Globe batteries produced today are a result of continuous product research and development . . . plus the finest, most scientific methods of manufacture. They have the advantage of nearly half a century of battery-engineering experience . . . 33 years of manufacturing batteries for autos, trucks, heavy machinery and army tanks.

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SHORTIES

Average American families are putting 700 miles more a year on the family car than they used to do 15 years ago.

•

In 1942, the Federal debt amounted to $541 per person. By 1953, the Federal debt for every man, woman, and child came to $1681.

•

The total debt by all government in the U. S. came to $300 billion by the end of fiscal 1953. Of this amount, 89 per cent was owed by the Federal Government.

•

Special state taxes on gasoline alone yielded $2.223 billion in the fiscal year of 1954. State sales taxes on all other products totaled $2.536 billion.

•

Gross national product in the U. S. today is 3½ times the value of the goods and services produced in 1929. The cost of government is 10 times as great.

•

In twelve seconds a modern research plane can fly 5½ miles. It took the Wright Brothers' first plane 12 seconds to fly 40 yards.

•

An 11-ton electronic calculator at a major aircraft plant solves problems in six minutes that would take an expert mathematician eight years to solve.

•

Many of the 89 million new automobile and truck tires needed to keep America rolling this year will be made from oil-derived synthetic rubber.

•

The $8 billion invested and plowed back into the oil industry in the past five years has increased production and reserves by one barrel for every four produced in 1945.

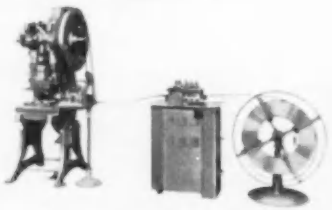
•

One of every six American businesses is automotive.

FLEXIBILITY
in Stock Straightening

WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

4319 W. 24th Place • Chicago 23, Illinois

Service makes a difference when you ship by United Air Lines Air Freight

Mr. Charles F. Pennock, Philadelphia wholesale florist, inspects an air freight shipment arrival.

United Air Lines has always specialized in service designed to meet individual shipping needs.

Take, for example, flowers. A steady user of United Air Lines Air Freight service is the S. S. Pennock Co., nation's largest wholesale florists with main offices in Philadelphia. Mr. Charles F. Pennock, President, says: "United Air Lines is recognized throughout the industry as an air carrier of flowers and has gone out of its way to co-operate with florists to find the best means of handling flowers for air shipment."

In the same way United Air Lines can help solve your shipping problems with specialized service for fragile, perishable or unusual products and for scheduling of shipments. You'll notice a *difference* when you ship by United.

Discover the advantages of United Air Lines Reserved Space Air Freight—write for "Industry's Flying Partner," Cargo Sales, Dept. 1-5 United Air Lines, 5959 S. Cicero Avenue, Chicago

MORE THAN 254 MAINLINER® FLIGHTS DAILY—AIR CARGO ON EVERY ONE

ON OUR WASHINGTON WIRE

Two Government-sponsored research reports on titanium are newly placed on sale by the Office of Technical Services, U. S. Commerce Dept., Washington 25, D. C.

One study (PB 111568), entitled "The Effect of Hydrogen on the Mechanical Properties of Titanium and Titanium Alloys" is priced at $2.25. The second report (PB 111478), "The Effect of the Cutting Fluid When Turning Titanium," is 50¢.

New TUNG-SOL All-Glass Sealed Beam

VISION-AID HEADLAMP

IMPROVED BEAM PROVIDES BETTER VISIBILITY

VISION-AID HEADLAMP is the most powerful and the safest headlamp ever developed. Light output has been increased by raising the lower beam wattage from 35 to 40 and the upper beam from 45 to 50 watts.

VISION-AID HEADLAMP provides 23 per cent more light on the low beam and 26 per cent more light on the high beam.

VISION-AID HEADLAMP projects the passing beam up to 80 feet farther ahead, but more to the right, at the same time reducing the amount of light directed toward an approaching vehicle.

VISION-AID HEADLAMP produces less uncontrolled light, thereby reducing the light reflected back at the driver from fog, rain, dust or snow encountered in bad weather.

TWO TYPES
5040 for 6 volts
5400 for 12 volts

TUNG-SOL ELECTRIC INC., Newark 4, N. J.

Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Philadelphia, Seattle.
Tung-Sol makes All-Glass Sealed Beam Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes, and Semiconductor Products.

The business expansion of recent months has brought total production to a rate approximating the peaks reached in the spring of 1953. Gross national product in the first quarter of 1955 was larger than in any previous first quarter in U. S. history.

Performance data on aviation gasolines and jet fuels are listed in a new Government report, "National Annual Survey of Aviation Gasoline and Aviation Jet Fuel, 1954 Production." Copies may be obtained from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh.

Profits from Government contracts made in 1955 and 1956 are expected to be subject to renegotiation, despite protests from industry. A measure extending the Defense Contracts Renegotiation Act for two years has cleared the House and is expected to find smooth sailing in the Senate.

Flow of some military information, especially technical data and compilations on military weapons and processes, will be reduced somewhat in the future under terms of a new Defense Dept. order.

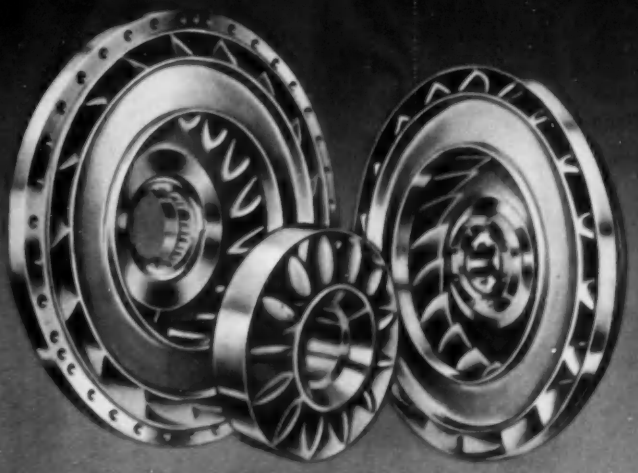
In the new fiscal year starting July 1, the nation's total defense bill, including activity both at home and abroad, will come to about $41.2 billion. This is well over half the total Federal budget.

Proposal to increase the minimum wage from 75 to 90 cents an hour would add $234 million a year to the straight-time wages of 1.3 million workers, Labor Dept. says. Average wage increase for this group of workers would be nine cents an hour.

Private and organizational access to classified atomic energy data of a non-military type is to be simplified under a new Atomic Energy Commission program.

Five Advantages of TORCON

- **A Complete Line** of torque converters—from 15 up to 600 HP
- **High Efficiency** through wide range of 600 to 1700 rpm
- **Hydra-Foil Blade**—Clark-Torcon design: for effective multiplication, *no cavitation*
- **Easy Accessibility** for inspection and service; no special tools required
- **Broadest Line of Options**—readily adaptable to any torque transmission system; matched to almost any source of power for greatest efficiency and economy



It's another practical proof that it's good business to do business with Clark

CLARK EQUIPMENT COMPANY • BUCHANAN • Battle Creek, Jackson and Benton Harbor, Michigan

CLARK® EQUIPMENT

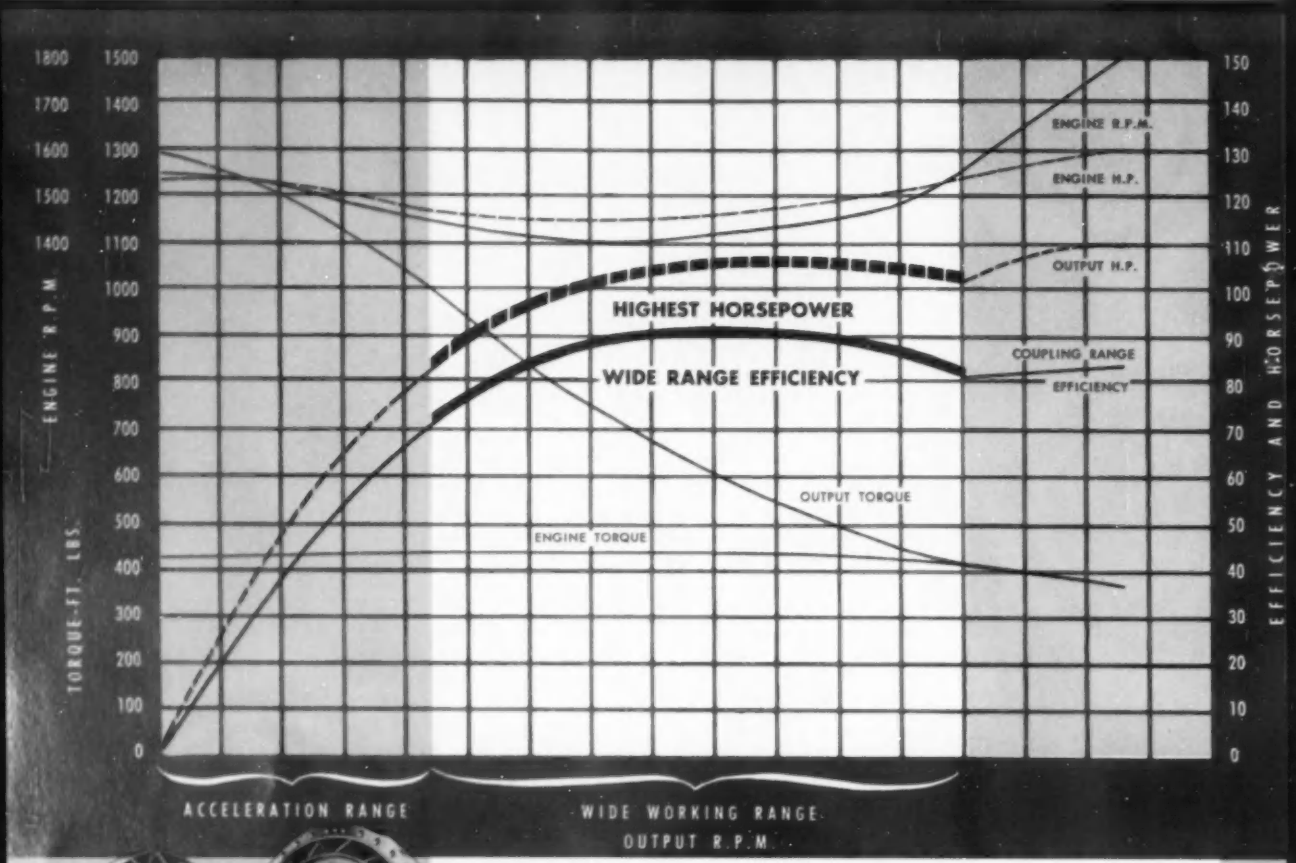
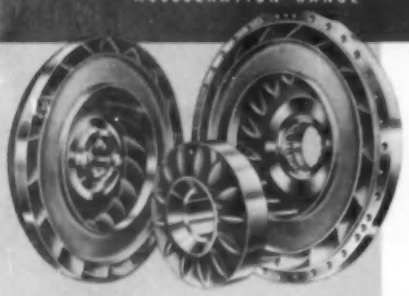


Chart Efficiency Curve 600 to 1700 rpm



TORCON

Torque Converters

offer high efficiency over wider working range .. USE *more of your horsepower more of the time.*

Here is a complete line of high quality torque converters, distinguished for uniform high efficiency over wide working ranges.

The Torcon "package" is a standard unit, mass-produced, available with a pump, cooler and pressure regulator. It is available off-the-shelf to engine and original equipment manufacturers, as well as to owners and operators seeking to modernize their equipment. With a wide range of wheel diameters and a complete line of options, the Torcon unit can be fitted easily and effectively into practically any torque-transmission system.

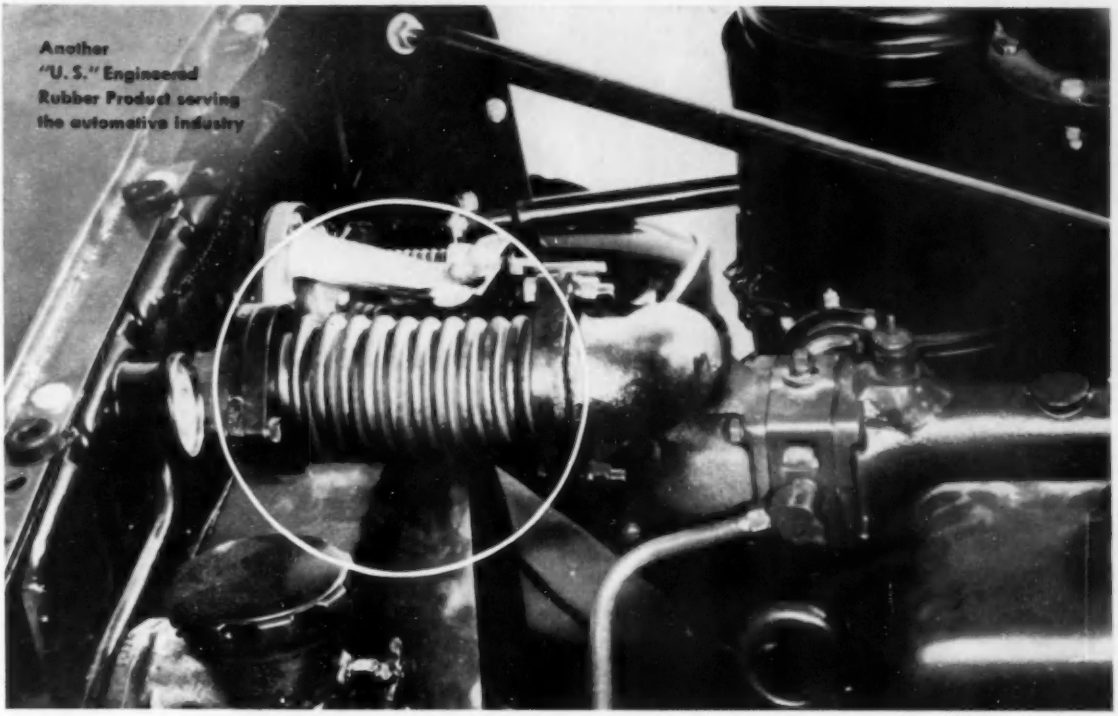
Without fail, check the Torcon quality features listed here; and consult Clark-Torcon engineers for experienced aid in planning your torque converter application. Write for full information.

CHECK THESE BASIC QUALITY FEATURES OF THE TORCON LINE

- **High efficiency over wide range**—produces more work and reduces wear on components.
- **True Hydra-foil blade**—best for torque multiplication; eliminates turbulence and resulting efficiency loss.
- **Most accessible unit**—inspection plates easily accessible; no special tools needed for service.
- **Self-contained oil circuit**—sump is an integral part of unit. Oil passages cored in housing—no unnecessary fittings or hoses; no leakage, no external oil seals under pressure.
- **Individually cast single-piece elements**—no welds or fabrications to distort under extreme loads.
- **A complete line**—15 to 600 H.P.
- **Broadest line of options**—readily adaptable to a wide range of applications.
- **Self-contained unit**—makes for simple installation.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
JACKSON, MICHIGAN



Have YOUR hose and connections the "GIVE" it takes?

U. S. MULTI-FLEX "gives" movement in extension and compression—indefinitely!

Multi-Flex® has proved its superiority for a wide number of applications, including radiators, carburetor air intakes, boots for hydraulic pistons, shock absorbers, worm gears and sensitive adjusting screws, exhaust outlets for garages, and hundreds more.

For example, as a connection between the cast tubular line from the radiator and the engine tubular line, U. S. Multi-Flex provides *flexibility*, allows the engine to move without transmitting force, both laterally and fore and aft on the radiator. Unlike Multi-Flex, a rigid piece of hose would exert a high degree of leverage force on the radiator and the radiator tank. Multi-Flex is available with flanges at either end; it also can be fastened in the conventional manner with clamps.

Since it's made without molds, special mandrels, or supporting wires, natural or synthetic rubber Multi-Flex can be fabric-reinforced, too—produced in inside diameters all the way from ⅛" to 36", in lengths unlimited. And one special Multi-Flex formulation withstands temperatures from −65°F to 500°F! Unlike wire supported hose, it can be crushed repeatedly without harm.

The extensibility of Multi-Flex makes short lengths practical; its ease of application (with slip-over nipple or flange connectors) saves assembly line time. For *"all-ways"* flexibility—for the greatest travel with the least fatigue—for *economy* and *long life*, you'll find you just can't match Multi-Flex.

Most samples for experimental use can be made without tooling charges. For samples and engineering service, phone us in Detroit at Trinity 4-3500. It's your contact with *specialists* in automotive rubber applications.

"U.S." Research perfects it... "U.S." Production builds it.

UNITED STATES RUBBER COMPANY

Automotive Sales, Mechanical Goods Division · New Center Bldg., Detroit 2, Michigan

HOW IT OPERATES

WAGNER PUTS THE "*AUTO*" IN AUTOMATION

If your metal finishing operations are still being carried on with obsolete equipment which loses money for you every day, we can put you ahead of your competition, increase your profit margin.

Increased production lowers the unit cost of your parts processing operations – you spend less for labor, less for power and increase your capacity to handle more business.

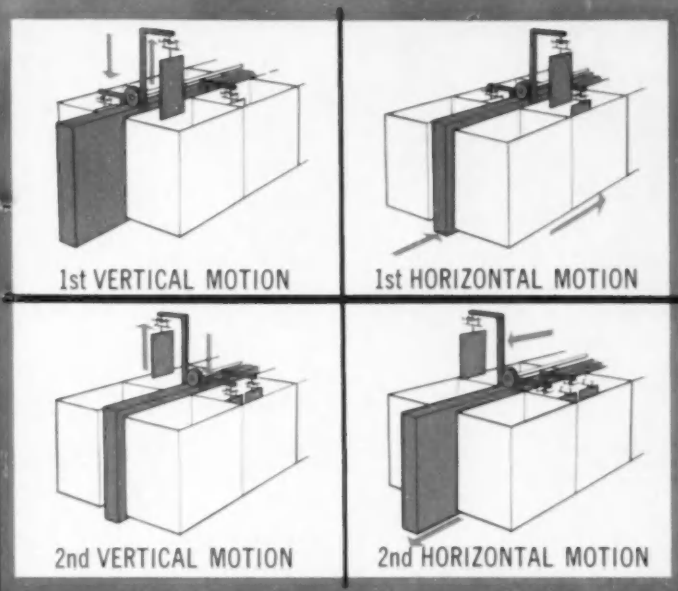
Wagner Brothers Full Automatic* Electroplating systems offer you a new and revolutionary concept in high-volume plating mechanisms – the product of years of engineering research and design refinements – for completely automatic cycling of your metal finishing operations.

*Patents Pending

Basic design details of Wagner Brothers Automatic Plating systems are described and illustrated in Bulletin 50-54, available free upon request.

AUTOMOTIVE MANUFACTURER MODERNIZES WITH WAGNER BROTHERS AUTOMATIC PLATING SYSTEM

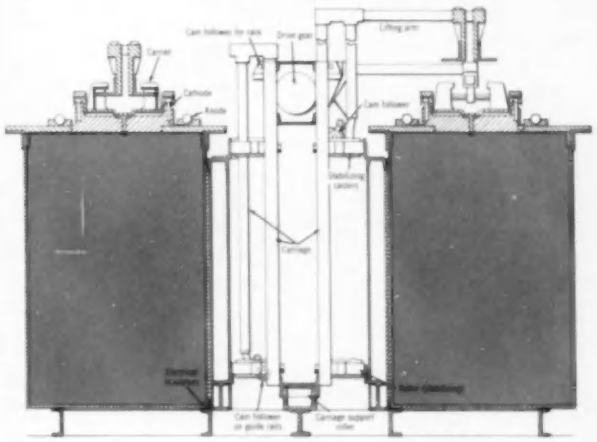
This fully automatic plating system was recently installed at a Bay City, Michigan plant for one of the world's largest manufacturers of passenger cars. The unit is 203 feet long, 11 feet wide and operates under 16-foot head-room. Die cast parts are continuously processed through a 40 station copper-nickel-chromium cycle. Production rate is 100 racks per hour, using racks 24″ long, 10″ wide and 64″ deep. Power is furnished by one 25-HP motor. Unit is provided with a push-button central lubrication system, built-in rack stripper, vertical and horizontal agitation. Racks are automatically loaded, unloaded.



HOW IT OPERATES

All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transfered and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. Sequence is simultaneously produced in reverse on the opposite side so that, when lifting arms are lowered on one side, they rise on the other side.



The entire carriage mechanism is suspended on rollers moving in an oil-filled channel track. This carriage is motivated by a hydro-motor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.

ADVANTAGES and FEATURES

SMOOTH OPERATION — Hydromotor power principle *eases* parts through the plating cycle without jolting starts and stops. Parts never jar from work-carriers into tanks.

LOW POWER NEEDS — Almost perfect balance of work load being lifted at one time requires only *low hydraulic pressures*. One 25-HP motor operates the 203 foot automatic shown.

SIMPLE INSTALLATION — Automatics are delivered to your plant either intact or in 2 or 3 completely assembled sections, depending upon size. *You avoid costly installation.*

MINIMIZED MAINTENANCE — There are fewer moving parts, no vibrating parts, no backlash in automation, low hydraulic pressures, no alignment problems. Overload protection is built into the hydraulic pump. Working parts are easily reached without disassembly.

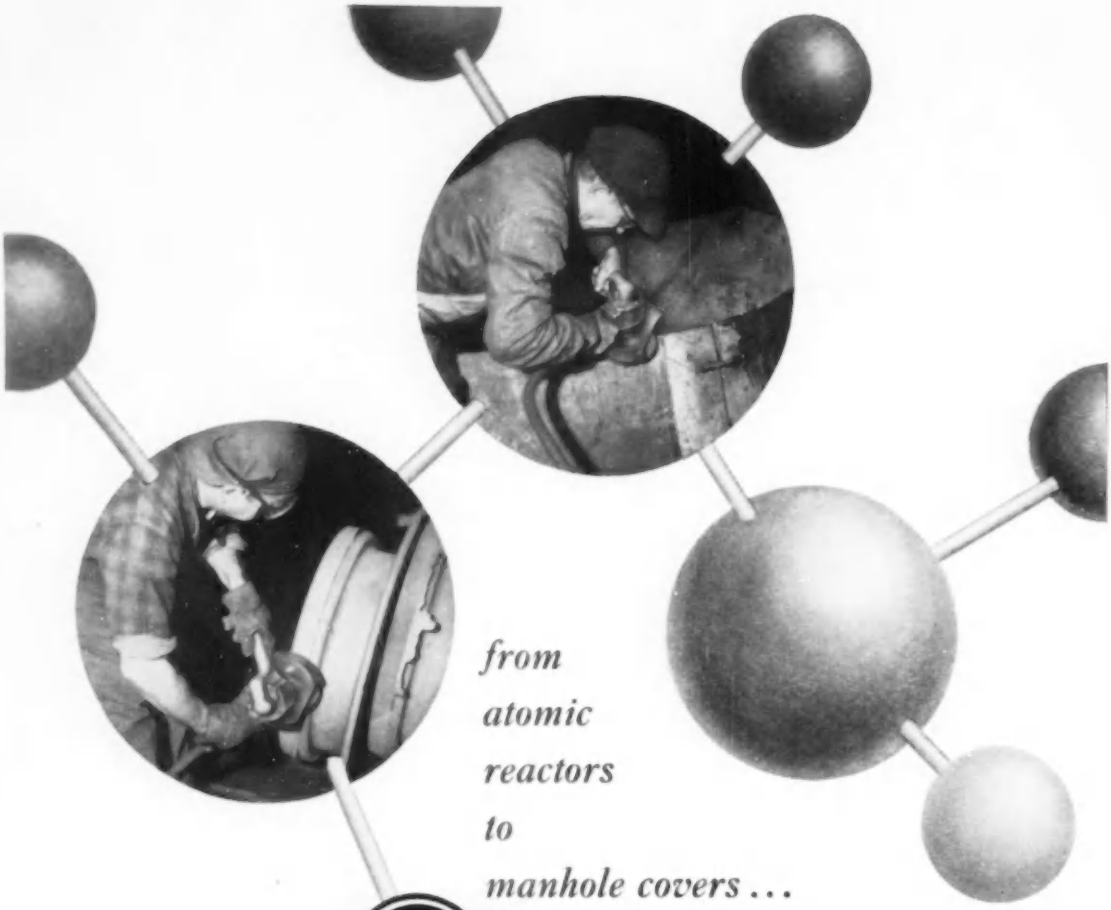
OTHER FEATURES —

OPERATES UNDER LOW HEAD-ROOM REQUIREMENTS • NO OIL-DRIPPING CONNECTIONS OVER TANKS • TRIPLE CONTACT CATHODE BARS FOR SMOOTH CURRENT FLOW • AUTOMATIC HEAT CONTROL FOR ACCURATE RESULTS • CENTRAL LUBRICATION SYSTEM • EASILY VARIED DRAG AND DWELL TIME

In addition to high-volume plating, the Wagner Brothers Automatic is equally-well-suited to anodizing (sulfuric and chromic), phosphate coating, etching, electropolishing, oxide coating, etc.

WAGNER BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.



from atomic reactors to manhole covers . . .

7 pound CP grinder grinds them all!

Here's a grinder that can't be beat for handling ease and versatility. It's the 7 lb. air powered CP-3190 Vertical Grinder. Whatever the job . . . whether it's precision contour grinding for joining components of an atomic reactor or the heavy duty snagging of grey iron from manhole cover castings, the compact CP-3190 affords maximum removal of metal with the least amount of effort.

Designed for long life and an absolute minimum of maintenance, the CP-3190 has a splined type floating rotor that prevents end-plate wear from wheel thrust. A large oil reservoir and self-lubricator provide continuous lubrication. Available in capacities capable of handling 6″ cup wheels and 7″ and 9″ disc sanding pads and cut-off wheels and in speeds up to 8000 RPM.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

INDUSTRY GEARS FOR HIGHER PRODUCTIVE STANDARDS

C.P.C. and THE BUDD COMPANY take a new look at frame production

The specially designed 1,000 ton press shown here illustrates a new approach to the production of automotive frame sections—edgewise forming of blanks into the irregularly-shaped frames. *Clearing Productivity Consultants worked with The Budd Company to develop this unique press for their specific requirements. An unusual slide action and automatic feed were developed which simplify the forming operation, speed material handling and conserve material.

Throughout industry, far-sighted manufacturers are meeting the pressure of rising costs with improved metalforming methods suggested by *C.P.C. This service is comprised of a staff of engineers who have worked directly with firms in every field of press metalworking. The experience of these men can be combined with yours to help work out solutions for higher production standards in your plant. Feel perfectly free to investigate this service. Call or write us at no obligation.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION . . . U.S. INDUSTRIES, INC. USI CMC

6499 WEST 65th STREET, CHICAGO 38, ILLINOIS • HAMILTON PLANT, HAMILTON, OHIO

Friction Surfaces Need Parco Lubrite

Wear is a problem wherever there is sliding or rolling contact. Parco Lubrite controls wear on metal friction surfaces.

The phosphate coating produced by Parco Lubrite is nonmetallic, provides a separating layer of phosphate crystals that holds lubrication, prevents metal to metal contact during break-in, minimizes scoring and scuffing.

Parco Lubrite is used on shafts, gears, pistons, cylinder liners, valves, rings, and scores of other parts. The inexpensive, simple, quick process gives uniform high-quality results.

The friction surfaces of your product will be improved by Parco Lubrite. Full information is yours on request.

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

Since 1915—leader in the field

PARKER RUST PROOF COMPANY
2178 E. Milwaukee, Detroit 11, Michigan

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

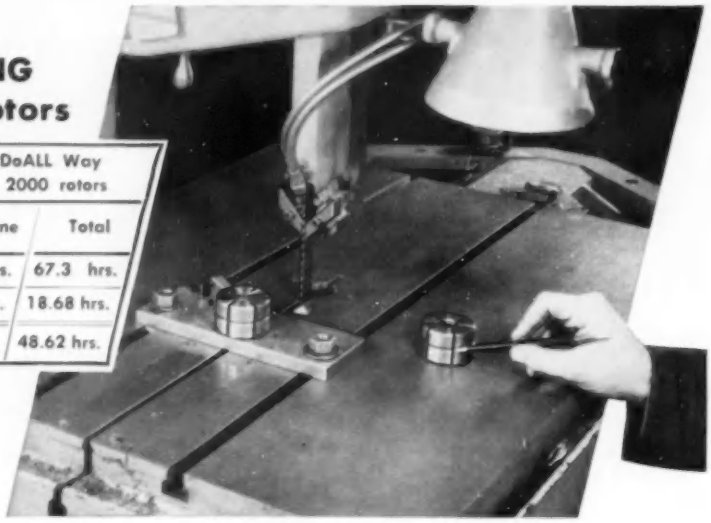
McLouth STAINLESS Steel

High quality stainless sheet and strip steel . . . for the product you make today and the product you plan for tomorrow.

McLouth Steel Corporation
DETROIT, MICHIGAN
Manufacturers of Stainless and Carbon Steels

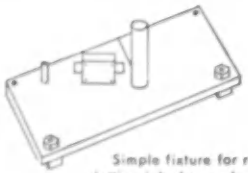
72% TIME SAVING
Cutting Slots in Rotors

Comparison — Old Way Versus DoALL Way Machining .100 x .4375 slots in 2000 rotors				
	Set-up	Load and Unload	Machine	Total
Old Way	0.7 hr.	19.5 hrs.	47.1 hrs.	67.3 hrs.
DoALL Way	0.08 hr.	7.7 hrs.	10.9 hrs.	18.68 hrs.
Saving	0.62 hr.	11.8 hrs.	36.2 hrs.	48.62 hrs.



You Can Reduce Your Production Costs With This New Machining Concept!

B/M* Bonus... Fixturing Costs Less



Simple fixture for rotor slotting job shown above.

Cutting forces hold work down on the table. Thus, simple back-up bars, clamps or holding fixtures are all that's needed—just something to hold the work in position while the table feeds it automatically into the continuous-cutting band.

*Band Machining.

CONTINUOUS band machining, the most efficient of all machining techniques, is now being widely used on many production line operations in place of slower, more costly methods such as milling, shaping, planing and even turning. Two DoALL developments have opened this new opportunity for cost reduction:

New Contour-matic Band Machines. Hydraulic power-feed tables. Recirculating coolant system and air jet. More power. Greater rigidity. Four sizes—16", 26", 36" and 60" throats.

New Demon High Speed Steel and Band Tools. These band tools will cut up to 6 times faster, last up to 10 times longer than any previous saw bands. They can be driven to red heat temperatures without losing hardness.

Here, then, is a team to cut your costs ⅓ to ½ or more on slotting, splitting, notching, cutting grinding reliefs, contour cutting and many other jobs.

Ask for a free demonstration at your plant. Call your local DoALL Store (see classified directory), or write:

The DoALL Company, Des Plaines, Illinois

DoALL

PS-9

NEW COLOR FILM—"Production Band Machining" now available showing operation of this new machining concept.

Friendly DoALL Stores... (in 40 cities)

Personalized Service...Complete Stocks...Local Delivery

Call Your DoALL Service-Store
DoALL
SAW BANDS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill

EDUCATIONAL STUDY WALL CHARTS

Economic Principles

$1.00 each postpaid

Lower quantity prices.

AIRBRIEFS

(*Continued from page* 110)

This new device protects aircraft against explosions and fires caused by fuel/air mixtures within the aircraft. Production models of the Chance Vought F7U-3 Cutlass are now being delivered to the U. S. Navy equipped with Explosion and Fire Suppression Systems, according to an announcement released by the manufacturers, Simmonds Aerocessories, Inc. They state that the F7U-3 is the world's first protection model aircraft to fly with this new type passive defense system. In addition to protection for the fuel cells it also includes protection for the leading edge cavities. This latter feature of the installation on the Cutlass was designed in conjunction with the engineering staff of Chance Vought Aircraft Co.

AiResearch Expands

The Garrett Corp. of Los Angeles, Calif., has broken ground for a new $1,300,000 administrative and engineering office building. The new building represents an extensive addition to its present AiResearch Manufacturing Division plant located adjacent to the Los Angeles International Airport. A total of 82,000 sq ft of floor space will be provided as a new headquarters for administrative officials of the Garrett Corporation and will also provide for upwards of 1000 members of AiResearch Engineering Department.

Delivery of Utility and Executive Aircraft

During February, 1955, 320 one to ten place utility and executive aircraft were shipped by six companies, according to Joseph T. Geuting, Jr., manager of the Utility Airplane Council, Aircraft Industries Association of America. The shipments included 274 planes of four place or more and 46 one and two place aircraft, all with a total value of $5,156,000 compared to January shipments by the same six companies (namely Aero Design, Beech, Cessna, Mooney, Piper and Taylorcraft) when a total of 328 aircraft were shipped having a net billing price of $4,400,000.

How Fast Is Up?

On January 25, 1955, one of the latest U. S. jet fighters climbed to an altitude of 10,000 ft from a standing

Remember!

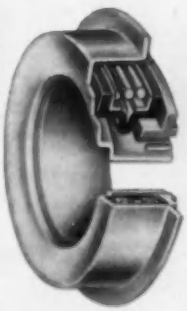
When you specify Mechanical Seals...

JOHN CRANE

can supply the exact seal you require

You can achieve the sealing efficiency you want . . . eliminate specification problems . . . work unhampered from drawing board to production—when you work hand-in-hand with "John Crane's" experienced engineering staff and available facilities.

Get quick, finger tip information on "John Crane's" complete line of high production mechanical seals—for every conceivable service—to meet your particular needs. Send now for illustrated technical catalog. It's your's upon request.



TYPE 6-A

Pressed-in packaged unit recommended for small shafts on hot or cold water, oil, gasoline or soapy liquids . . . pressures to 75 psi . . . temperatures from —65° F. to +220° F. Available in stainless steel or bronze.

TYPE 11-A

Pressed-in packaged unit with spring inside synthetic rubber bellows to protect against corrosion. For hot or cold water, oil, gasoline or soapy liquids . . . pressures to 35 psi . . . temperatures from —65° F. to +212° F.

TYPE 19

An all-purpose seal suitable for handling practically any liquid or gas, including highly corrosive acids and oils.

Low or high temperatures from —100° F. to +450° F. . . . pressures to 200 psi. Incorporates highly efficient sealing cones made of Du Pont's Teflon, which is inert to practically all chemicals.

Crane Packing Company, 1835 W. Cuyler Ave., Chicago 13, Ill.

In Canada: Crane Packing Co., Ltd., 617 Parkdale Avenue, N., Hamilton, Ont.

JOHN CRANE CRANE PACKING COMPANY 38 YEARS INDUSTRIAL PROGRESS

ground start in 83 sec. On February 21 this remarkable record had been shattered three times by fighter-interceptors of three aircraft manufacturers. By the time you read this the record will, no doubt, have been shattered several more times. In fact, the latest unofficial climb recorded to 10,000 ft from a standing ground start is 56 sec.

Air Museum

On April 12, 1955, the Ford Instrument Co., Division of The Sperry Corp., observed its 40th anniversary by dedicating a permanent museum illustrating progress in the science of weapons control. The museum is the only one of its kind in the greater New York area devoted primarily to the history of weapons control. Included among the exhibits is the world's first automatic tracking bombsight, first time-of-flight clock, first anti-aircraft computer and gun director and first automatic computer and plotter for artillery battery direction.

Named the Ford Museum, the exhibit was dedicated as a memorial to Hannibal C. Ford, founder of the Ford Instrument Co. and one of America's very distinguished inventors. His development of the computer to automatically solve the problem of range between two moving ships practically revolutionized naval warfare.

Air Education

The National Aeronautic Association and the National Aviation Council have associated together to expand the air education program and meet the challenge which the air age has brought to education. NAA, for many years, has been alerting the public to national air mindedness and air responsibility and the new National Aviation Education Council has already begun a successful program to bring the influence of the air age to the education profession.

The NAA has underwritten a budget for a period of three years at approximately $30,000 per year, for the purpose of establishing a secretariat in Washington and the employment of a full time executive director for aviation education. Dr. Evan Evans, Superintendent of Schools of District 110, Overland Park, Kansas, and immediate past president of NAEC, has been chosen as executive director by the NAEC Board. He will move to Washington and assume his new duties on September 1, 1955.

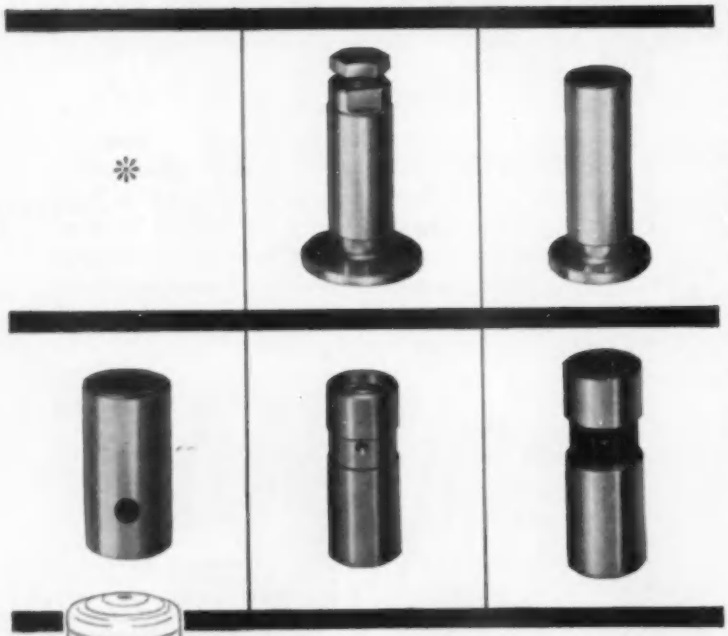
Under his direction the air education program will be expanded and an enlarged program of teacher education and community relations will be undertaken.

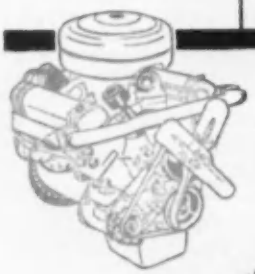
Daylight Saving Flights

The scheduled airlines of the United States will operate their flights on daylight saving time in cities and sections of the country where the time switch is applied, according to Frank J. Macklin, assistant vice-president traffic of the Air Transport Association.

Airline timetables will specify arrival and departure times in terms of the time system in effect locally. Timetables that are effective in daylight time are marked to note the differences.

JOHNSON *tappets*





keep pace with today's engines

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"tappets are our business"

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Hydraulics on Lift Trucks

By F. C. Schuster
The Buda Co.—Div. of Allis Chalmers Co.

HYDRAULICS has become a very important factor in the development of the fork lift truck. Hydraulic systems offer several outstanding advantages: Simplicity; controllability; and most important from a safety standpoint, a means of preventing overloading. In the case of electric trucks only one electric motor is required to drive a pump in order to perform two or more functions, whereas each function would require an individual electric motor if electro-mechanical devices were employed. In the majority of cases truck designs can utilize hydraulics in its simplest form. Only the main components such as a pump, valve and cylinder are necessary to provide the means to elevate loads. One more control valve and cylinder provide the operator with a means for tilting as well as lifting loads.

In the majority of hydraulic systems up to 1500 psi capacity, gear and vane type pumps are used. However, gear and piston type pumps are available which are capable of producing pressures over 3000 psi. Pumps are usually directly coupled to electric motors, or in the case of lift trucks equipped with internal combustion engines, they may be coupled to the crankshaft or driven by the timing gear train. Hydraulic pumps for electric trucks are subjected to intermittent duty whereas in combustion engine equipped machines the pump operates continuously while the engine is running, although not under continuous full load.

Spool and poppet type control valves have received general acceptance in lift truck hydraulic systems although other types of valves are also used. They may be electrically or manually operated and have single or multiple sections. For lift truck use, valves must be designed for smooth control and minimum internal leakage to avoid drift in the tilt mechanism and to prevent the elevated load from dropping. A combined relief and control valve requires less space and reduces the number of lines and fittings in the hydraulic circuit. Relief valves must operate quietly and be designed so that the differential between the "cracking" and "wide open" stage is held to a minimum. Generally this range, if held within

(*Turn to page* 178, *please*)

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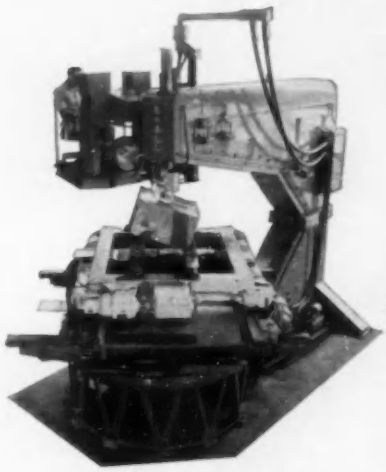

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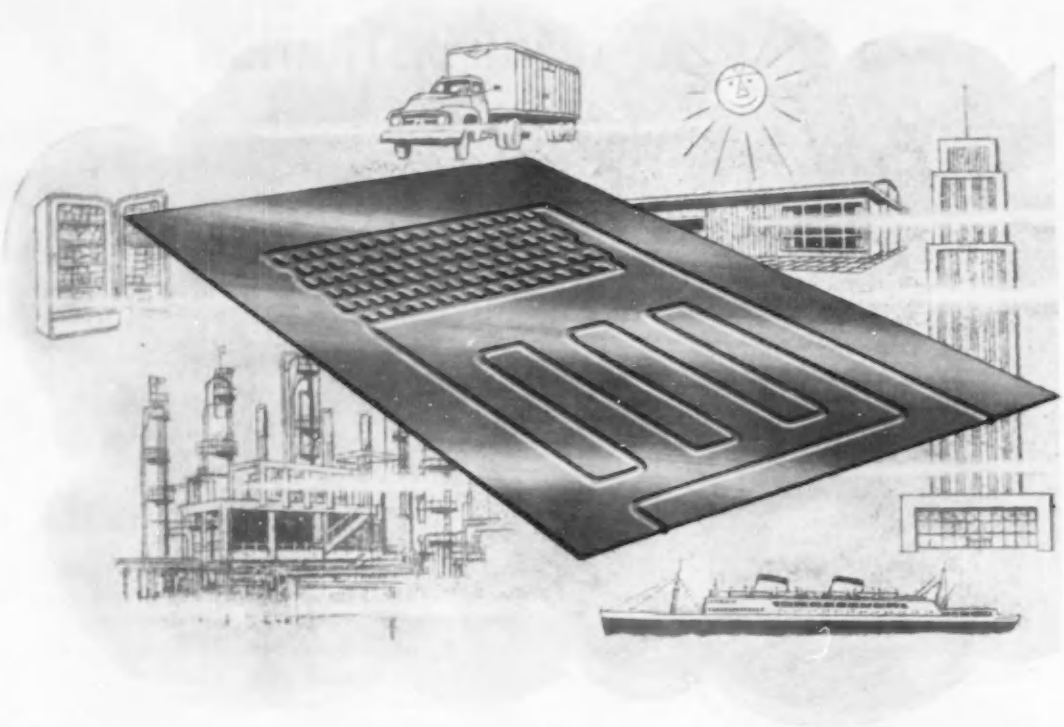

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Gas Turbine Combustion Development

By K. L. Rieke
Development Engineering
Steam Division
Westinghouse Electric Corp.,
South Philadelphia, Pa.

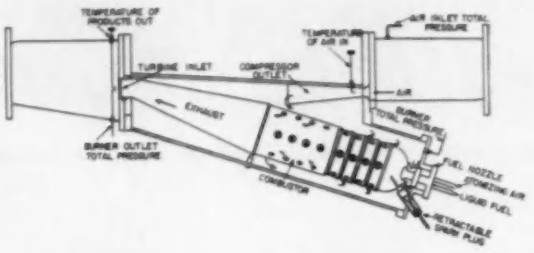

FIG. 1
Cross section of the Westinghouse gas turbine combustion chamber

Gas turbine combustion problems are twofold: (1) The effective release of chemical energy by combustion of fuel within highly confined spaces and (2) the high temperature corrosion of residual oil ash on turbine and turbine blade materials.

Comparing the heat release range (Btu/hr/ft 3/atmosphere) of a gas turbine combustor with the average heat release range of the high pressure steam boiler, we find the boiler operates at a heat release range of 60,000 to 300,000 while the gas turbine combustor operates at 1,000,000 to 1,500,000 Btu/hr/ft 3/atmosphere. Thus we see chemical energy release of the combustor is five to 15 times greater than the average steam boiler. (Based on the cross-sectional flow area of our gas turbine combustor, the heat release is in the order of 4,000,000 Btu/hr/ft 2/atmosphere.)

The corrosion of turbine blade materials by residual oil ash is similar to that being experienced in high-pressure, high-temperature steam boiler superheater tubes.

Let us first consider how the facilities of the new Development Laboratory of the Steam Division, Westinghouse Electric Corp. at South Philadelphia, Pa., can be utilized to develop better combustor performance.

Facilities for gas turbine combustion development have been installed on the third floor of the Development Laboratory. Two combustion chamber passages, completely instrumented are available for testing various burner configurations (Fig. 2). Various interconnections of five installed air compressors provide the following maximum air flow capacities:

1. 8000 cfm of free air at 60 in. water pressure
2. 9600 cfm at 75 psig
3. 124,000 cfm at 30 psig, and
4. 80,000 cfm at 75 psig.

The inlet air to the combustion chamber passage is heated to simulate combustor operation under regenerative flow conditions in the gas turbine. Flexibility in controls, instrumentation, and test passages gives maximum utilization of test facilities.

Fuels tested are gaseous fuels (1000

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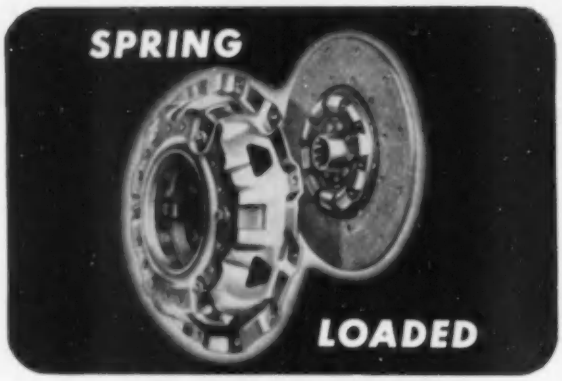

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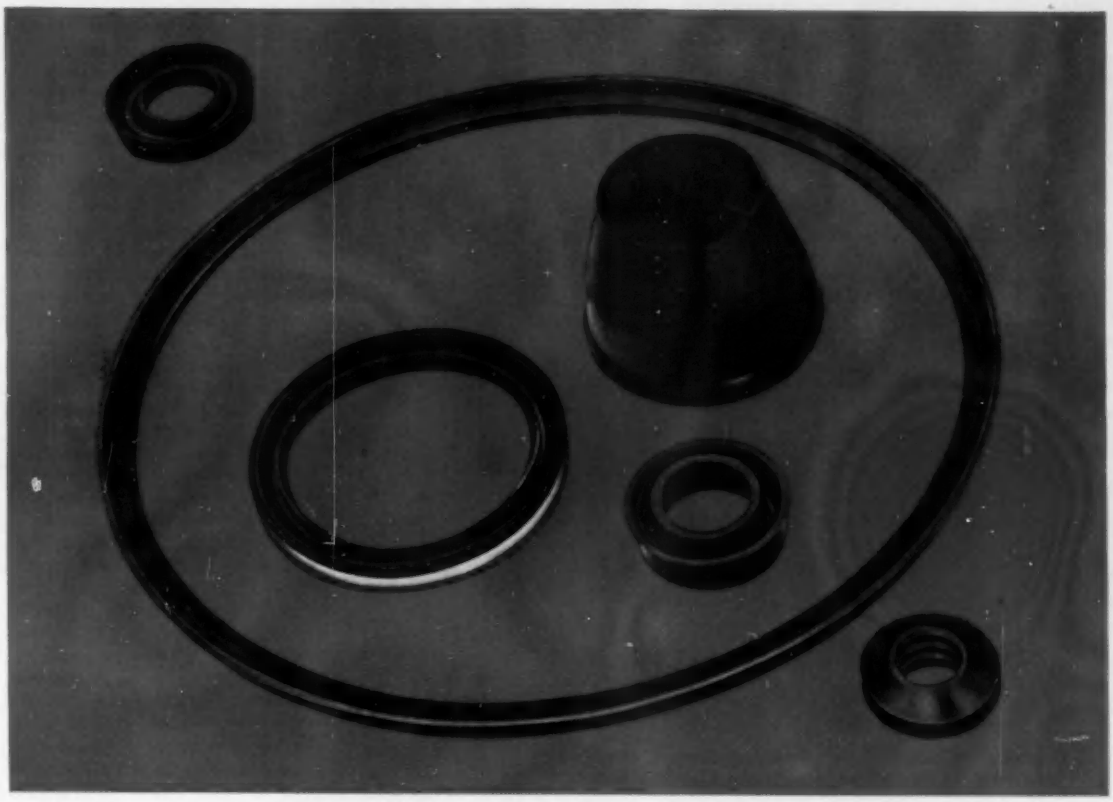

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At the present time we are able to burn satisfactorily in the combustion chamber practically any commercial gas, fuel oil, or residual oil. However, development work is in progress to obtain better combustor performance that will increase the turbine cycle performance.

As new methods of turbine cooling and new high-temperature alloys are developed, gas turbines will be operated at higher temperatures and the combustor will be called on to deliver gases whose temperatures may be 1800 F and above. Investigation of improved combustor cooling, necessary air and fuel distribution in the combustor, and improved fuel nozzle design is in progress to insure optimum burner performance and long service life at these high turbine inlet temperatures.

In conjunction with the combustion test program, a fuel nozzle development program is under way. A satisfactory combustor comprises a fuel spray nozzle and a basket matched to give the optimum fuel-air distribution in the combustion zone. Design and testing of various liquid-fuel, gaseous-fuel, and dual-fuel nozzles is an important phase of this program. The dual-fuel nozzle can be used when gaseous or liquid fuels are used interchangeably, without shutdown for nozzle change.

The second problem in residual oil combustion is the corrosion of blade materials from oil ash formed during the combustion process. Turbine blade materials disintegrate at high temperatures after only 50 hours exposure in 1600 F exhaust gases of some residual oils. The high corrosion rate is attributed to vanadium pentoxide and sodium sulfate formed during the combustion process. Vanadium, sodium, and sulfur are found in most residual oils. Both vanadium pentoxide and sodium sulfate in their molten states are highly corrosive, and unfortunately their molten-state temperature range is the same as the turbine operating temperature—1200 to 1650 F.

The residual oil corrosion problem is being actively investigated. The immediate solution is the use of selected grades of residual oil with suitable ash characteristics, or modification of residual fuels by the use of oil additives that form a complex ash with the vanadium pentoxide and so-

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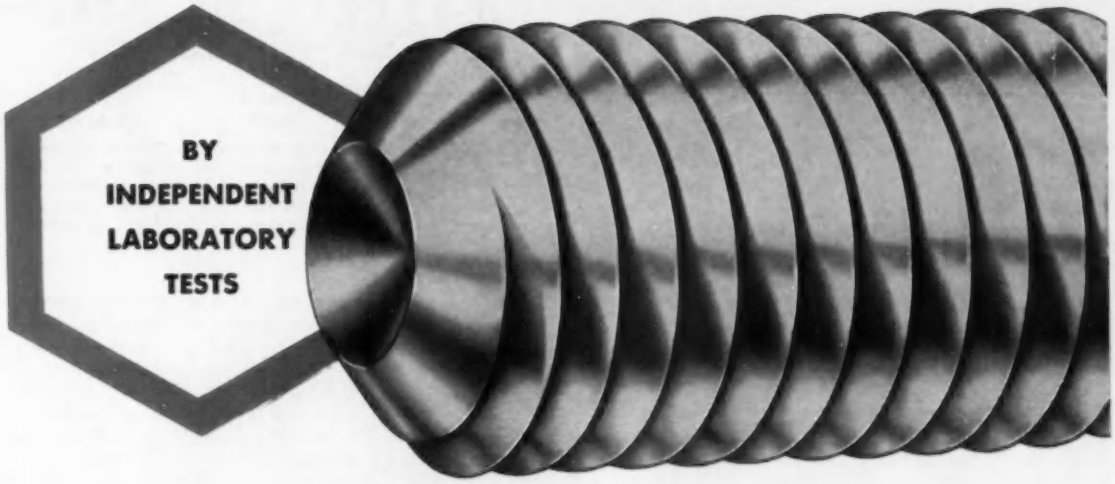

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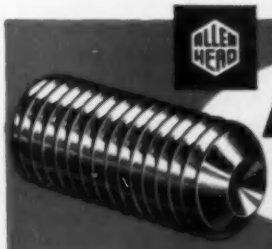

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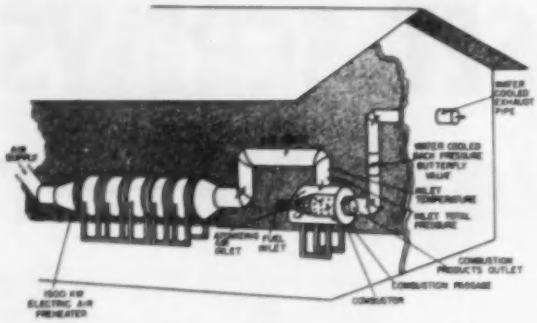

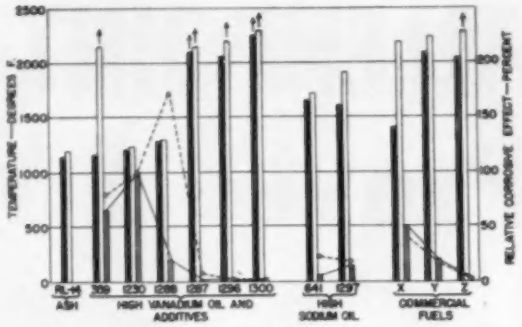

FIG. 2 *(Left)*

Sketch shows laboratory setup for combustor development, two test ways being used.

FIG. 3 *(Above)*

Chart showing relative amount of corrosion expected from various fuel ashes.

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dium sulfate. The additive increases the melting temperature of the complex ash so that it is above the maximum turbine operating temperature. Combustion equipment has been installed in the development laboratory to measure the relative resistance to corrosion of various materials. The high temperature (1400 to 1700 F) exhaust gases from residual oil combustors is passed over test specimens at approximately the same velocity as that entering the turbine nozzles, and the corrosion is measured by weight loss during various time increments.

In conjunction with the combustion corrosion test equipment, ash-fusion temperature apparatus is used to study the melting characteristics of the residual oil ashes and the additive oil ashes. The melting points of these ashes indicate the relative degree of corrosion of turbine materials that might be expected. This is illustrated in Fig. 3. The vertical bar on the left is the temperature at which the ash shows initial melting; the middle bar shows the final melting point. The bar on the right indicates the relative corrosive effect of the ashes with the corrosion rate of high vanadium oil No. 1230 taken as 100 per cent. The solid lines connecting the corrosion bars indicate corrosion at 1400 F gas temperature and the dotted lines that at 1600 F. As the initial melting temperature is increased above the exhaust gas temperature by use of additives (1287, 1296, and 1300), the corrosion rate dropped rapidly. This theory of corrosion has been checked by combustion corrosion tests and we believe the corrosion problem is solved by the use of additives in the oil. However, investigation is continuing

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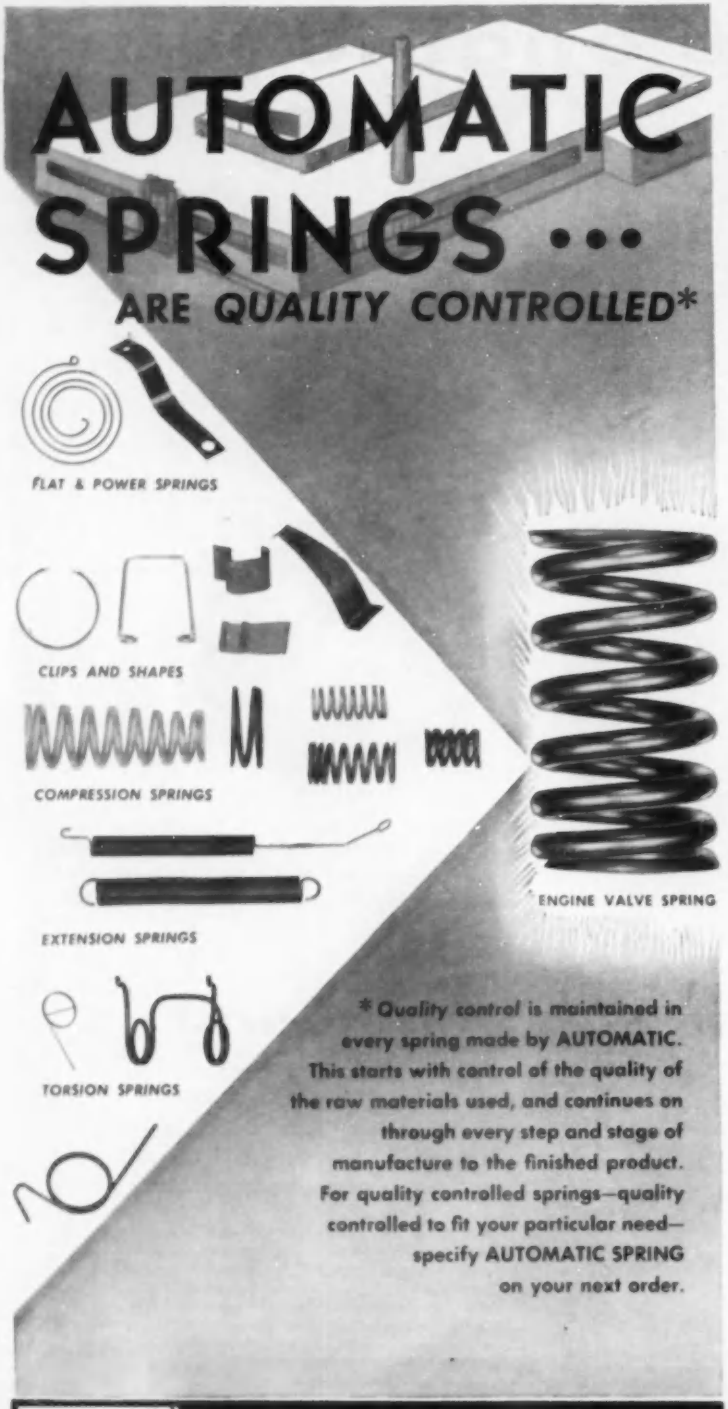
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to learn more about additives to see if the problem cannot be solved more simply by the oil refineries. For the future we are also investigating, and will continue to investigate, new turbine and blade alloys, blade plating, and blade coatings that will be free from vanadium or sodium corrosion.

The above article is from a paper presented by the author at the new Steam and Gas Turbine Development Laboratory, Westinghouse Electric Corp., South Philadelphia, Pa. This new facility was described in the March 1 issue of AI, page 15.

Hydraulics on Lift Trucks

(*Continued from page* 168)

10 per cent will prove satisfactory.

The lift truck industry in general is anxiously awaiting the further development of hydraulic components which will be reasonably priced and rated for pressures of from 2000 to 3000 psi capacity. Of course, success will depend a great deal on efficient performance and economical production of these developments.

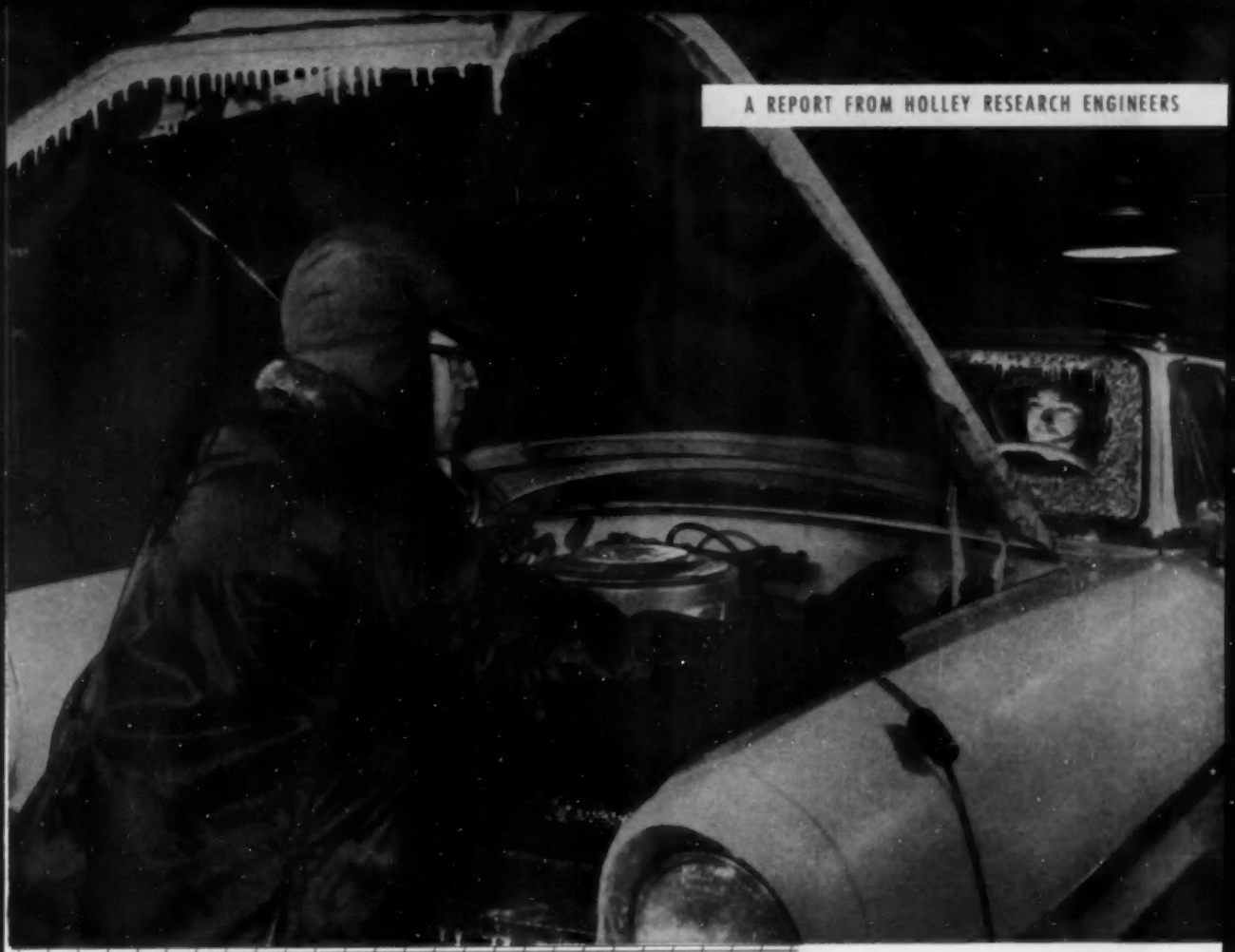
Designs of hydraulic fittings, flexible hose and steel tubing now available will accommodate the higher pressures; therefore, at the present time the lift truck industry is mainly in need of more suitable pumps and valves. Higher pressure systems require less displacement of oil, therefore, smaller lines and fittings can be used which will result in an appreciable savings. Generally smaller cylinders will improve visibility. The torque converter, basically a hydraulic component, provides many advantages heretofore unavailable in lift trucks such as smooth acceleration, increased tractive effort, cushioning of shock loads, and reduced driver fatigue. Engine, clutch, transmission, axle and tire life are increased considerably.

Lift truck designs incorporating the torque converter utilize hydraulics in several ways. In most cases hydraulic pumps and pressure loading valves are used to maintain pressure in the converter. In some cases valves and cylinders are utilized to provide the means of controlling engagement of the power source with the rest of the traction system.

Other types of fluid drives have and are being developed which indicates that the application of hydraulics has not reached its limit in the designs of lift trucks.

Hydraulic steering applications in

(*Turn to page* 184, *please*)



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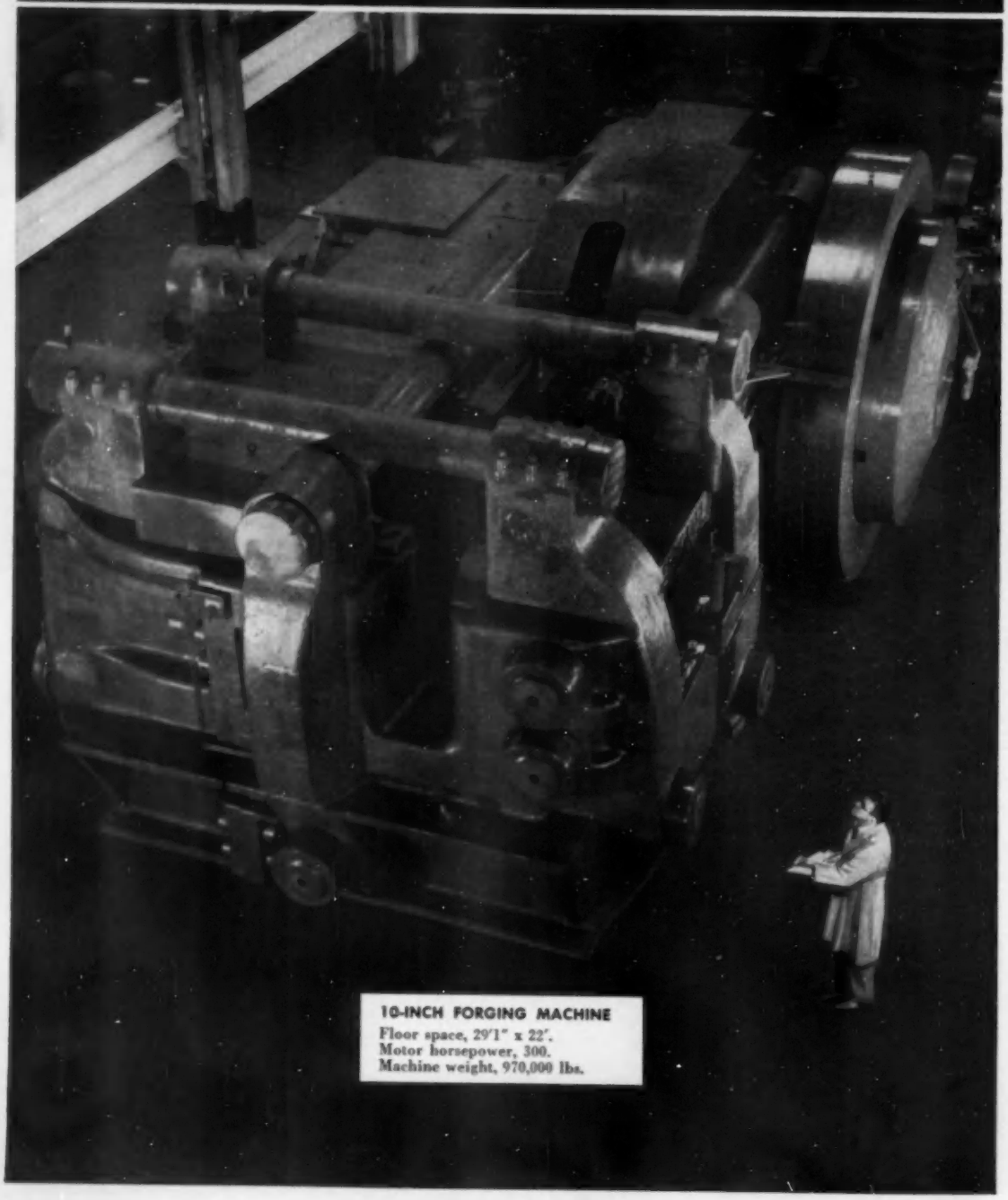

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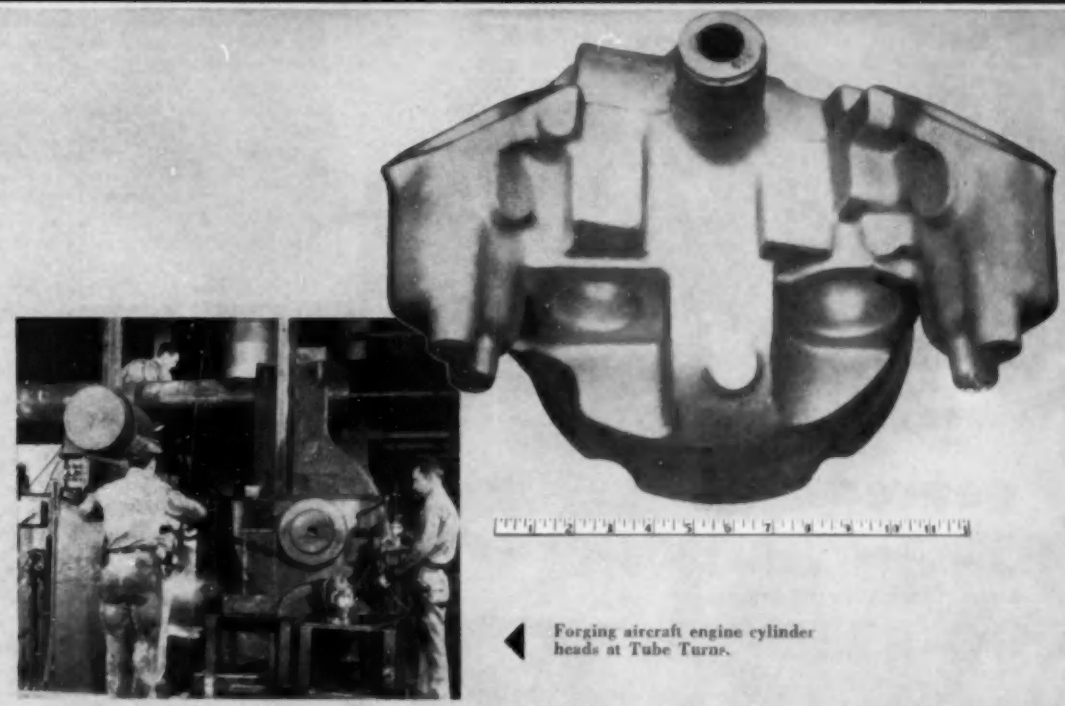
Machine weight, 970,000 lbs.

A 10-INCH NATIONAL . . . Horizontal Forging Machine!



Forging aircraft engine cylinder heads at Tube Turns.

Tube Turns of Louisville, Ky., relies upon a 10-inch National — the largest horizontal forging machine in the world — to produce efficiently the 72-pound aluminum aircraft engine cylinder head forging illustrated above.

The progressive Tube Turns organization — a division of National Cylinder Gas Company — has long been recognized for its leadership in producing important commercial and aircraft forgings. The installation of the 10-inch Forging Machine is another step in the company's progress.

This is another example of teamwork between forward-looking industry and National Machinery to develop advanced forging methods. To help you "flow metal," our years of experience are available to apply to your forging job, be it routine or unusual, hot or cold, ferrous or non-ferrous, automatic or semi-automatic.

We would be pleased to welcome you at our plant — "World Headquarters for Forging Engineering" — where tomorrow's new and better ways of producing metal parts are already being tested today!

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Flex-Roll

Mergers and the Monopoly Myth

(Continued from page 68)

class there are now at least three producers in contrast to the early Twenties when Ford accounted for about one-half the entire market and had little competition in the low-priced field. Fewer numbers do not necessarily mean lessened competition. The credit given Henry Ford for maintaining competition in the industry, and for refusing to join a trade association or to participate in a patent pool, seems somewhat misplaced. His firm had a greater proportion of industry sales than ever achieved by any other firm. If credit is to be given for competitive behavior, some credit should be given to those firms which effectively dislodged Ford from his control of the low-priced field. Competition does not consist of platitudes by a benevolent despot. The rise of General Motors and Chrysler is more indicative of competition in the automobile industry than Ford's refusal to become a member of the Association of Licensed Automobile Manufacturers. In the same manner the growth of a fourth large firm, even if industry numbers decline from nine to six, or five, may result in more effective competition.

What of the Future?

If innovation and product development are a test of competitiveness, what does the future hold if the number of producers continues to decline? It would appear that in this respect the consumer is fortunate. Though numbers decline, there is good reason for the remaining producers to continue product innovation and improvement. A market which is primarily replacement shrinks if the product life improves. In the automobile industry, however, there is the phenomenon of the used car. The market for new automobiles is only a small sector of the total market for automobiles. Increasing the life of the vehicle increases the pool of unused mileage available and so could reduce the demand for new cars. But there is also another effect. Increasing thelife of the automobile reduces the per mile cost and thus makes possible an increased ownership. This also makes values more stable. Increased life and lower costs makes the so-called market saturation point recede. This is clearly what has occurred historically.

An argument for continued innovation regardless of number of producers rests upon the expansionary effects of product change. If innovation in the product ceased, the differences between the new and used vehicle would narrow and the number of years a car would be held would probably increase. The effect of this could be multifold. It could initially mean that fewer cars of low mileage would enter the used car market. Those persons who do not buy new cars but purchase low mileage used cars would either be forced to buy new cars or be satisfied with older cars. The producer could intensify his advertising, but in the long run innovation would be more effective because of the expansionary effects of the total market, both used and new. Thus the used car acts as a perpetual pressure upon the producer to continue a flow of innovations and the number of producers is not the only competitive force for innovation and product improvement. As long as automobile producers have this market pressure the consumer is likely to benefit in the form of improved product.

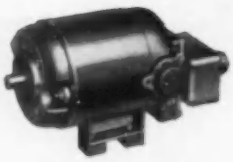
geared

to work closely with your engineers on motor-driven products

We work so closely with customers that some consider our facilities a part of their own operations.

Close cooperation of our staff with your purchasing and engineering departments assures the right motor for your product.

This can mean improved product appearance, reduced weight, greater compactness and lower costs.



Aircraft de-icing pump motor.

Gear motor for slow-speed drive.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

In Canada: Lamb Electric—Division of Sangamo Company Ltd.—Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Flex-Roll Processing

Absolutely Essential

FOR BETTER DEEP DRAWS

THE Automotive and Appliance industries have long been aware of product improvement due to Flex Roll Processing. Low carbon steel as supplied by the steel mills for deep drawn parts, requires a cold working prior to the press operation, to eliminate stretcher strain, improve surface appearance and minimize scrap losses.

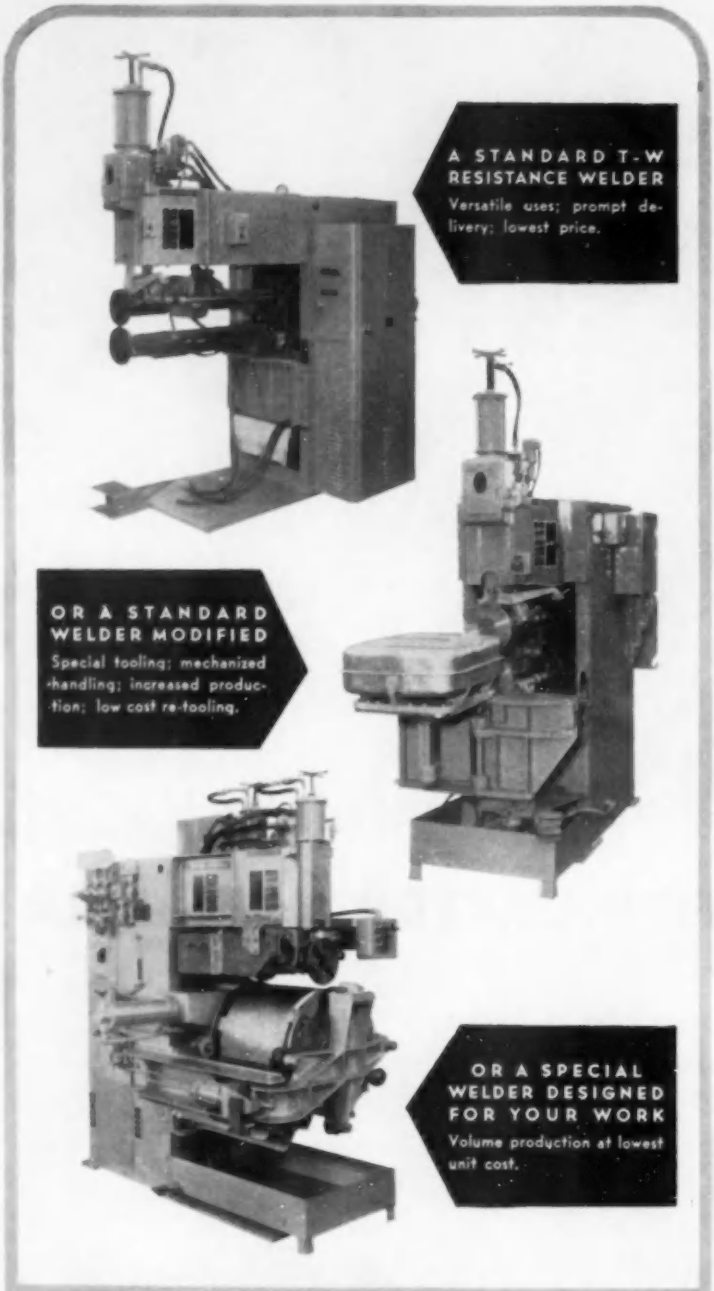
The new McKay Flex Roll Processor combines thorough cleaning with efficient filtering of cleaning fluid and effective cold working of the steel sheet to prepare it for severe deep draws.

McKay engineers will appreciate the opportunity of demonstrating the benefits of Flex Roll Processing.

The compact, neat new McKay Flex Roll unit that requires no special installation. Just set it in place, plug it in and it's ready to go to work.

THE McKAY MACHINE COMPANY
YOUNGSTOWN, OHIO

McK


A STANDARD T-W RESISTANCE WELDER
Versatile uses; prompt delivery; lowest price.
OR A STANDARD WELDER MODIFIED
Special tooling; mechanized handling; increased production; low cost re-tooling.
OR A SPECIAL WELDER DESIGNED FOR YOUR WORK
Volume production at lowest unit cost.

Resistance Welders Since 1898

TAYLOR-WINFIELD
RESISTANCE WELDERS
SPOT • PROJECTION • SEAM • FLASH-BUTT

Sales and Service
CHARLOTTE • CHATTANOOGA
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LOS ANGELES • PHILADELPHIA
PORTLAND, OREGON • SEATTLE
ST. LOUIS • STAMFORD • WASHINGTON
OAKVILLE AND WINDSOR, ONTARIO

THE TAYLOR-WINFIELD CORPORATION WARREN, OHIO

Hydraulics on Lift Trucks

(*Continued from page* 178)

lift trucks differ from automotive applications in that greater effort is generally required; however, high speed conditions do not prevail. The hydraulic system for lifting and tilting loads can and in some cases is being utilized to provide the power for steering. In other instances auxiliary pump units driven by fan belts or other means are used.

The hydraulic starter, though originally developed for starting combustion engines at sub-zero temperatures, has safety advantages when used in a lift truck. It is comprised of a hydraulic motor, valve, and accumulator which is charged by a manually operated hand pump. As electrical equipment in a Diesel powered lift truck is needed only for starting the engine, the hydraulic starter makes it possible to eliminate all electrical equipment from trucks for use in hazardous areas. The existing hydraulic system in a lift truck can be utilized to automatically maintain full charge in the accumulator so that it is not necessary to manually charge the accumulator for each start.

One of the more complex trucks developed recently utilizing 3000 psi hydraulic pressures was designed for accurate placement and removal of dies in hydraulic die casting machines and entailed six hydraulic circuits. In addition to transporting dies, the unit is equipped with elevating forks so that a die can be leveled with the press bed. A single acting cylinder provides the elevating power. The next step in handling the die requires a means to push the load off the forks and on the press bed, and when removing the die, a means for pulling the die onto the truck. This operation is performed by the use of a double acting cylinder which actuates two racks. The racks in turn drive gear sectors which are directly connected to eight toggle arms. In this way positive and equalized motion is provided in either direction. After the die is placed on the press bed it is then necessary to accurately position it. The use of an overhead crane was not possible, therefore, a superstructure was provided on the truck to perform this work. The superstructure is elevated or lowered hydraulically so that it will clear the upper structure of the press. Another single acting cylinder provides the power required to perform this operation. The horizontal boom can be extended or retracted for longitudi-

CrysCoat*

MOVES IN THE BEST CIRCLES

Vornado room air conditioners give you perfect *summer coolness—winter warmth* automatically with finger-tip thermostat control. Beneath the beautiful, cool, Wedgwood green finish is a fine protective coating of CrysCoat to make it look better... last longer.

There's an Oakite CrysCoat Process to suit your particular set-up:—

1. Zinc phosphating in spray washer
2. Zinc phosphating in tank
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Each CrysCoat Process gives you a fine phosphate foundation for long-lasting paint adhesion.

Each CrysCoat Process protects against corrosion under the paint.

Each CrysCoat Process is easy to control.

Each CrysCoat Process is solidly backed by nationwide Oakite Service that unconditionally guarantees satisfaction.

Illustrated literature describing the Oakite CrysCoat Cleaning-Phosphating Process gladly mailed on letterhead request.
Oakite Products, Inc., 49 Rector Street, New York 6, N.Y.

**The Oakite CrysCoat Cleaning-Phosphating Process for preparing metals for painting*

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS · METHODS · SERVICE

SCIENCE

CrysCoated Products Look Better... Last Longer!

Technical Service Representatives Located in Principal Cities of United States and Canada

nal positioning of the die. A double acting cylinder in conjunction with a chain and sprocket mechanism provides this motion. A conventional swivel hook, provided to lift the die after the boom is positioned within the press structure, is also hydraulically operated.

For accurate lateral positioning, the swivel hook cable had to travel over a pulley so the simplest solution to this problem was to make the pulley move laterally. The pulley hub is in effect a double acting hydraulic cylinder and revolves on a stationary shaft. This shaft acts as a stationary piston and incorporates the porting. As oil is injected to one or the other side of the piston, the pulley, which is in effect a moving cylinder, is laterally positioned. Each of the six hydraulic circuits operates at a maximum pressure of 3000 psi and is controlled by an electrically operated valve. Solenoid valves were used to provide the operator with push button control and permit economical positioning of the valves. Efficiency of this operation might be improved if an operator with piano or piccalo playing experience were employed. One disadvantage of electrically actuated valves is that they are either fully open or closed. This was overcome by using flow regulators to control the desired speed for each function.

The above is an abstract of a paper presented at the Tenth Annual National Conference on Industrial Hydraulics, sponsored by The Illinois Institute of Technology in cooperation with the Chicago Chapters of eight technical societies.

MAXIMUM PERFORMANCE
MINIMUM MAINTENANCE

Through advanced design and creative engineering, BORG & BECK has stepped up the capacity of its passenger car clutches without increasing their over-all dimensions. Compact, light in weight, precision built—for maximum performance, minimum maintenance.

for that vital spot *where power takes hold of the load*

BORG & BECK
DIVISION OF BORG-WARNER
Chicago 38, Illinois

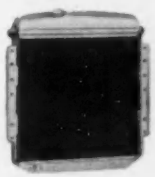
BOOKS...

YOUR INSURANCE AND HOW TO PROFIT BY IT, *by Michael H. Levy, published by Harcourt, Brace & Co., 383 Madison Ave., New York 17, N. Y. Price, $2.95.* This is a practical, non-technical guide for every insurance policy holder as well as anyone who may be contemplating the purchase of insurance for the first time. Combining common-sense practice and insurance know-how, the author answers simply and with humor basic questions that are of concern to all policy holders; how to determine what coverage you need, how to buy it, how to save money on what you buy, how to avoid wasting premiums, what to do in case of a loss.

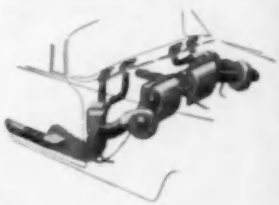
AUTO 1955, *published by Tudor Publishing Co., 221 Fourth Ave., New York 3, N. Y. Price, $7.50.* This book is a unique and comprehensive illustrated guide to world automobile design and production with over 300 photos, some in color. One of the most valuable features of the volume is the listing of technical specifications for each car displayed. Twelve countries are represented by their latest models. Appendices include tables of statistics on world automobile production, distribution and use. A special illustrated feature on the growth and development of coachmaking and body design from the earliest carriages to the latest experimental models is included.

HOLES, CONTOURS AND SURFACES, *by Richard F. Moore and Frederick C. Victory, published by Moore Special Tool Co., Inc., Bridgeport, Conn. Price, $7.50; $5.00 within the U. S. metalworking industry.* This authoritative and complete 424-page text is illustrated with more than 450 photographs and working drawings, including 184 pages of Woodworth Tables for converting holes from 3 to 100 on circles to rectangular coordinates. It is the purpose of this book to discuss methods and equipment which provide engineered solutions to one of the toolmaker's most serious problems: the accurate location of holes, contours and surfaces. The text then goes into detailed discussions of these solutions under the following chapter titles: The Problem of Location; Improvised Location Equipment and Methods; The Foundation of Accuracy; Engineered Location Equipment Standards; The Coordinate Locating System; Jig Boring Principles and Applications; Jig Boring Practices; Jig Grinding Principles and Applications; Jig Grinding Holes; Jig Grinding Contours; Linear Form Grinding Principles and Applications; Linear Form Grinding Practices; Inspection Methods; and Precision Pays Dividends.

STANDARD... **FOR THE STANDARD OF THE WORLD!**



Every new Cadillac is equipped with a compact, dependable Harrison radiator.



New Cadillac heater by Harrison features two blowers... four heat outlets.

NEW V-8 POWER BY CADILLAC... COOLING BY HARRISON!

Cadillac means quality right to the *core* . . . the core of its dependable Harrison radiator. This compact, high-efficiency unit is doing a top cooling job for the new high-compression, high-powered engine in the exciting Eldorado. In fact, Harrison has been the leader for many years in designing and building heat exchangers for automobiles. And with our modern and extensive research facilities—hot tunnels, cold tunnels, up-to-date testing equipment—we are constantly searching for *and finding* better ways to build radiators, heaters and defrosters . . . all kinds of heat-transfer equipment. If you have a hot or cold problem, look to Harrison for the answer!

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

HARRISON

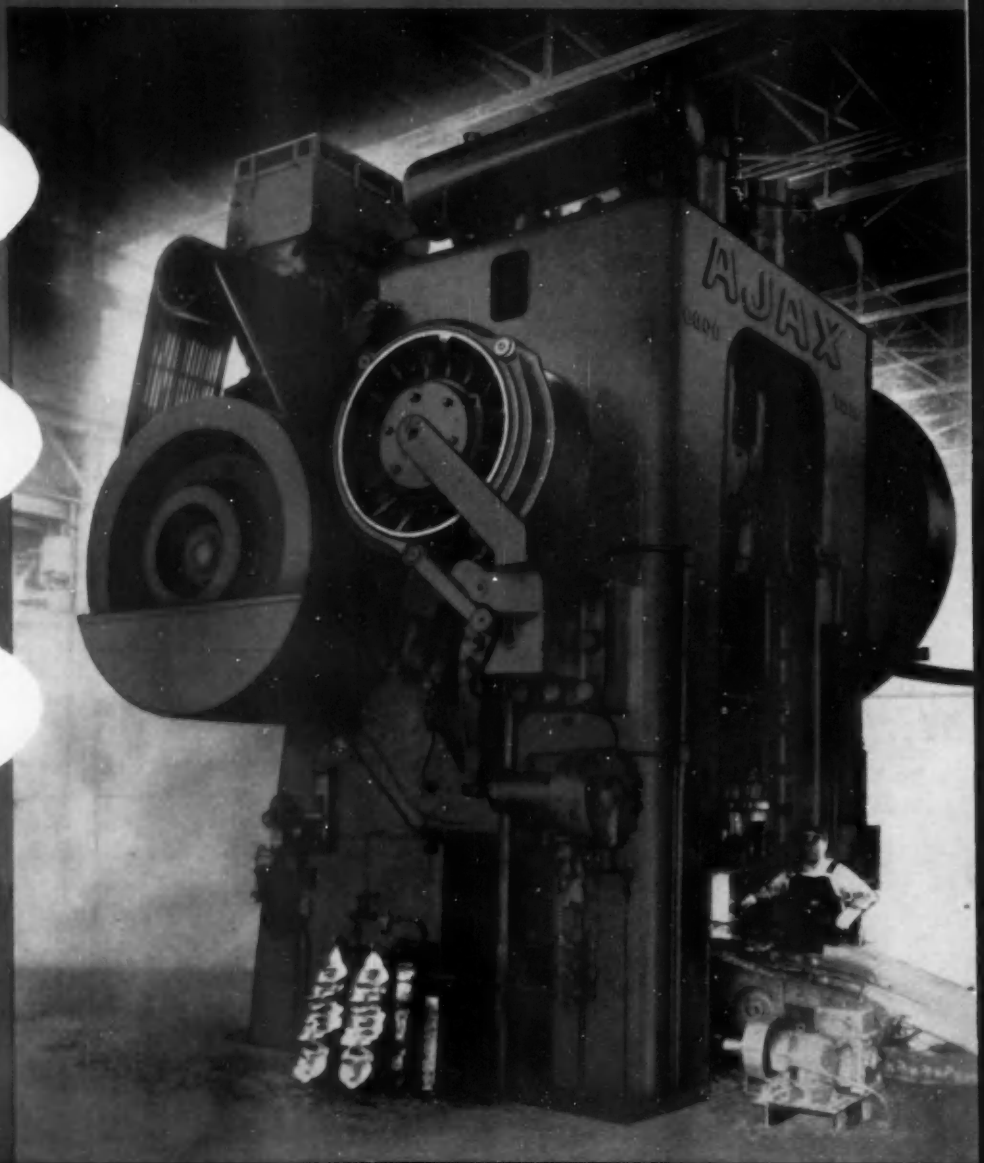
TEMPERATURES MADE TO ORDER

AJAX
high speed
FORGING PRESSES

SOLID STEEL FRAME

AIR CLUTCH OPERATED

SIZES 300 TON TO 8000 TON



Write for Bulletin 75-C

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST., CHICAGO 3, ILL. • DEWART BLDG. NEW LONDON, CONN.
W. P. WOOLDRIDGE CO.
1209 BURLINGAME AVE., BURLINGAME, CAL. • 6440 FLEET ST., LOS ANGELES 22, CAL.

AI TABLOID

(*Continued from page* 41)

Official attendance at the recent Ninth Western Metal Exposition was clocked at 53,639 persons.

* * *

El Segundo (Calif.) Div. of Vickers, Inc., plans an expansion of facilities for the design and manufacture of special hydraulic valves for aircraft applications.

* * *

Carlisle Chemical Works, Inc., subsidiary of Cincinnati Milling Machine Co., has purchased Advanced Solvents & Chemical Co. . . . Directors of American Machine & Metals, Inc., have approved an agreement to purchase Lamb Electric Co.

* * *

Cornell Aeronautical Laboratory has disclosed development of a new plastic wing that is said to have broad possibilities for aircraft and guided missile design.

* * *

Eastman Kodak Co. is now demonstrating new equipment for reportedly faster optical gaging of precision parts and tools.

* * *

American Brake Shoe Co. has taken over the air compressor business of the Defiance, O., plant of Lynch Corp.

* * *

Some time this summer the millionth post-war Volkswagen car is expected to roll off the assembly line in West Germany. Rumors persist of Volkswagen plans to set up a production plant in Mexico City.

* * *

Recently formed in Detroit is The March Corp. at 18101 Jas. Couzens Hwy. It will engage in technical sales of specialized products and services in the high temperature, corrosion resisting, and metallurgical fields.

* * *

North American Aviation, Inc., claims development of a method for casting durable forging dies from a copper alloy.

* * *

In addition to the development of new products for its industrial customers, diversification plans of National Vulcanized Fibre Co. included an entry into the consumer field.

(*Turn to page* 196, *please*)

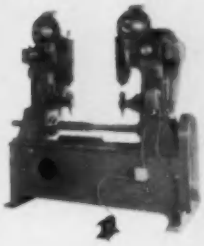
Save Labor . . . cut costs with

FASTER **Riveting and Clinching!**

T-J

RIVITORS

T-J RIVITOR used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembling, setting, inspecting and ejecting.



DOUBLE RIVITOR sets two rivets at a time! Equipped with 10" hoppers, and tooled to automatically feed and set two ¼" dia. x ⅝" long wagon box head rivets at a time in elevator chain and raddle or elevator flight assemblies for farm implements. Controlled by one foot pedal.

CLINCHORS

T-J CLINCHOR . . . one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets 11/16" square cased nuts in outside quarter panels, left and right hand.

DOUBLE CLINCHOR sets two nuts at once! Tooled to feed and set ⅜" x ½" x 1/16" thick Fabri-Steel nuts at each operation. Both Clinchors tripped by same foot-operated valve. Adaptable to wide range of clinch nut setting problems.

Automatic Feeding and Setting!

T-J meets your needs for labor saving SPEED in assembly . . . with performance-proved Rivitors and Clinchors for many jobs today . . . in aircraft, automotive, farm machinery, stampings of all kinds.

T-J CLINCHORS set clinch nuts 3 to 5 times faster! Fully automatic . . . controlled by a single foot pedal! Available in Underfeed and Gravity feed models, throat depths 8" to 36".

T-J RIVITORS automatically feed and set solid rivets . . . with high production! Electrically powered Rivitor sets 1/16" to ¼" diam. solid steel rivets up to ⅜" long. Air-powered Rivitor sets aluminum alloy rivets up to ¼" diam. or steel rivets up to ⅛" diam. and up to ¾" long. Throat depths 8" to 36".

Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

38 YEARS EXPERIENCE T-J

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

MOTOR FACTS ON INDUSTRY'S
MOST PREFERRED "POWER PACKAGE"

Electrical System Fact—Only the new Life-Line "A" motor gives you the unsurpassed corrosion-resistant protection of exclusive new Bondar, Bondite and Mylar* insulations.

*Du Pont Registered Trade-Mark

FACT:

The new Life-Line A is the most corrosion-resistant motor on the market

The corrosive action of chemicals takes a heavy toll on conventional motors. The new Westinghouse Life-Line® "A" motor offers more protection against corrosive atmospheres than any other motor you can buy. How?

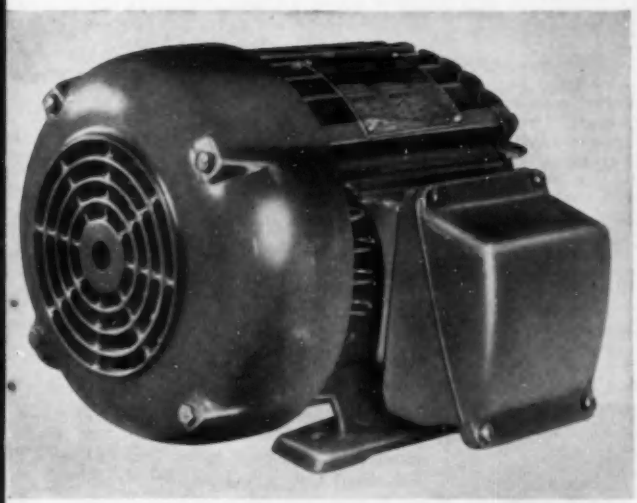
Because the combined improvements in insulation, housing and bearing design give unsurpassed protection against any contamination. It takes the right combination of such improvements in *all three systems*—electrical, mechanical and lubrication—to make the Life-Line "A" industry's most preferred power package.

Get all the facts by calling your Westinghouse sales engineer . . . *The Man With The Facts.*

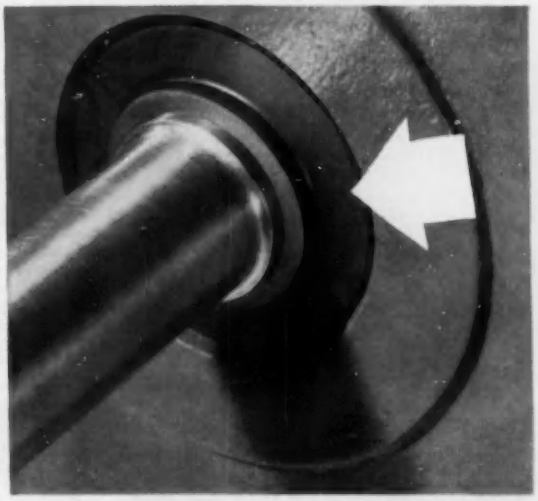
J-21881

YOU CAN BE SURE . . . IF IT'S

Westinghouse



Mechanical System Fact—New cast-iron frames and brackets utilize the finest grained castings with uniformly thick wall sections precisely fitted and sealed. Molded glass plastic cooling fans on totally-enclosed types are chemically inert.



Lubrication System Fact—The new pre-lubricated Life-Line "A" bearing features a "4-way seal"—*two* seals on each side. Totally-enclosed types have additional neoprene flinger which assures bearing protection in any corrosive application.

Inspection Procedures for the Acceptance or Rejection of Incoming Steel Shipments

By D. J. Heinlen
General Motors Corp.

A LITTLE over two years ago a Receiving Steel Inspection Crib was established at Ternstedt-Detroit. Before this time, most of the emphasis on improving production had been directed toward the tooling with the steel selection being on more of a trial-and-error basis. It has been the aim of the Steel Inspection Department, since its inauguration, to supplement this hit-and-miss technique with specific facts and scientific data concerning steel. In this way, better understanding and agreement may be reached between Purchasing, Engineering, Production, Material Control, Inspection, and the mill as to the proper steel for a particular job.

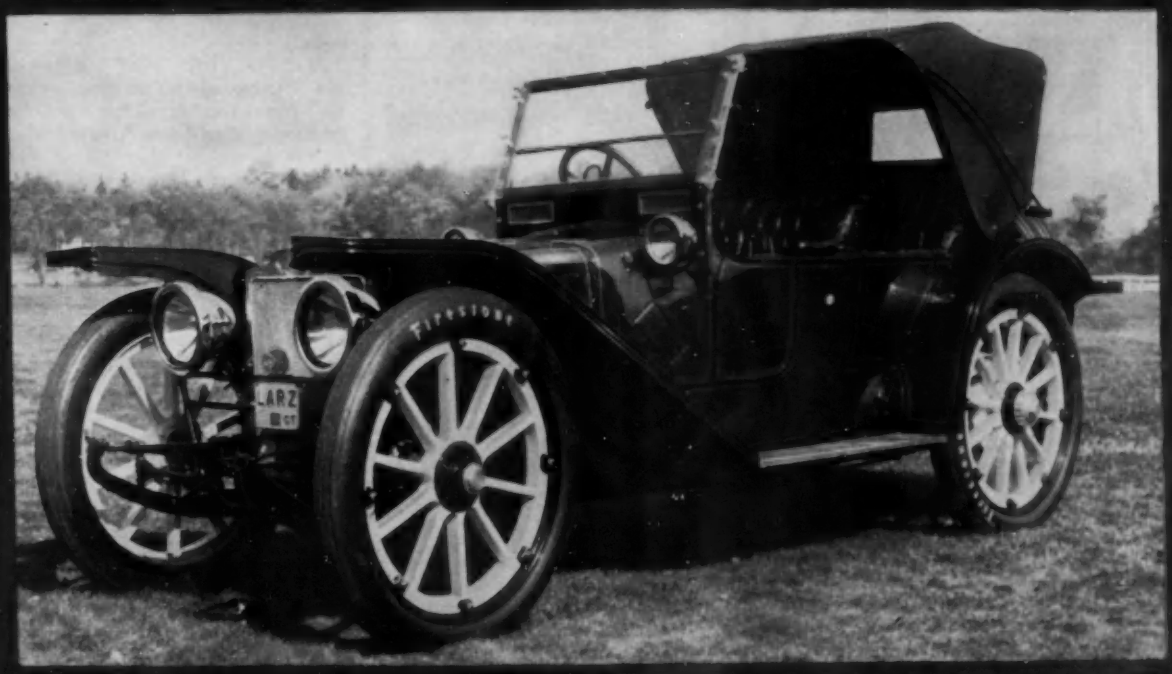
To assure the greatest possible success and efficiency of our steel-inspection program, we have endeavored to plug all loopholes through which defective steel might pass at the earliest stage possible. As a starter, steel shipments are checked by a steel inspector even before they are unloaded from the steel mill's trucks. At this time the inspector completes a quick but thorough inspection for (a) purchase dimensions, (b) physical damage to steel, (c) rust, (d) other conditions. If the steel passes this initial inspection it may be unloaded. However, if the shipment is badly damaged either physically or through evidence of rust, or if the dimensional requirements are far out of specification, it will be rejected on the truck and delivery refused.

When a steel shipment is accepted and unloaded, a member of the Material Handling Department applies a red paint stripe to the steel. This serves to designate that the steel has not been thoroughly inspected and is not to be released for production use.

After the steel is unloaded, it becomes necessary as part of the standard inspection procedure that all steel be further checked. A sampling table was found to give the best practical coverage. The number of coils on a skid and the width of the coils are the controlling factors in determining the proper representative sample size. Also, the number of different heats involved in a shipment is an influencing factor. If the steel samples are from coils or sheet stock destined for parts on a critical list, the samples are delivered to the Steel Inspection Laboratory where tensile test bars are pulled in addition to other prescribed physical tests.

If the job is not on this critical list, the inspector takes the samples to the crib in his area. Here the sample is subjected to a Rockwell test, bend test, visual surface check, and further dimensional checks. From these tests he may "OK" the steel or reject it. If rejected, a second red stripe is painted on the steel adjacent to the original one, and the foreman of the Steel Inspection Laboratory

YA
Radiators
...work their way from
TEXAS to CANADA!
These heavy duty, self-propelled combines start their year's work in the grain fields of Texas . . . and follow the harvest north to Canada. That means months of day-in, day-out rough going . . . the kind that tests the strength and cooling characteristics of the radiator. Only the best will stand this type of heavy-duty performance . . . and that's where Yates-American radiators fit into the picture to provide the double-duty cooling for both threshing and propelling. Specify Yates-American radiators as standard equipment on your products . . . write today for full information and descriptive literature.
California Representative: E. E. Richter & Son, Emeryville, Cal.
YA
Heat Transfer Products Division
Yates-American
BELOIT, WISCONSIN



Send For Free Print—1910 American Underslung

Directly opposite normal practice, the 1910 American Underslung featured a frame slung beneath the axles. With excellent road-holding capacities, it had a four-speed sliding-gear transmission, Bosch magneto ignition, and a 22-gallon fuel capacity.

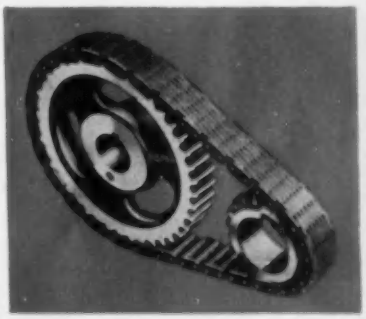
This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing. Morse Chain Company, 7601 Central Avenue, Detroit 10, Michigan.

60,000,000 Timing Chains— and growing every year!

Since the day when the first "horseless carriage" raced along at the breakneck speed of 10 miles per hour, Morse has supplied the auto industry with over 60,000,000 Timing Chain Drives. In fact, of the seventeen automobile manufacturers who use Timing Chains as original equipment, *thirteen* specify Morse Timing Chain Drives.

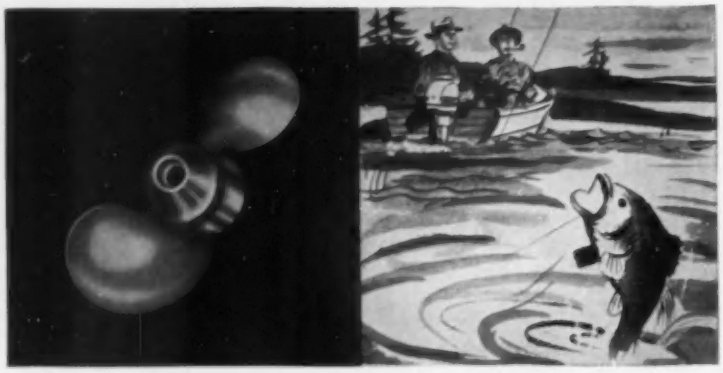
Precision-built Morse Timing Chain Drives give longer service life and relative freedom from maintenance. They operate safely, quietly, and smoothly —with positive timing.

Check into Morse Timing Chain Drives, and other Power Transmission Products (see below) manufactured by Morse. We have expert engineers available to help you in your power transmission needs. Write today for quick assistance on your problem. MORSE CHAIN COMPANY, 7601 CENTRAL AVENUE, DETROIT 10, MICHIGAN.

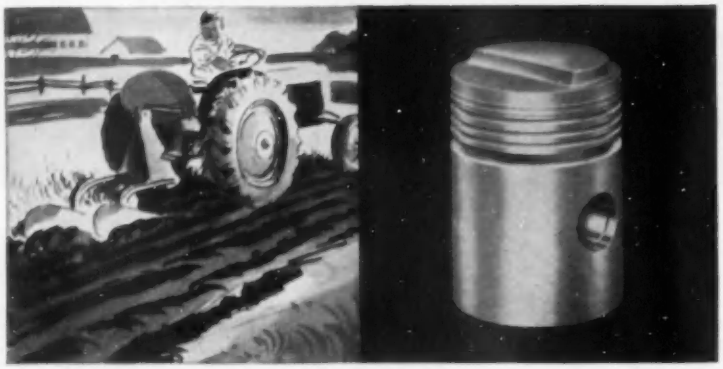


MORSE BW **CHAINS, CLUTCHES, AND COUPLINGS**

FOR 24 REASONS, MASTERS OF MECHANICAL POWER TRANSMISSION SINCE 1893



Fishing and Farming



Thompson Precision-Engineers Light Metal Castings for All Industry

THE fisherman trolling for the big one and the farmer working his south forty have one thing in common—both can count on Thompson. The fisherman's outboard motor and the farmer's tractor engine are each improved by precision-engineered castings produced by Thompson's versatile Light Metals Division.

In the case of the tractor, it's any one of several parts, including the piston, that is produced by Thompson — with the outboard motor, one of the parts produced by Thompson is the propeller.

Outboard motor propellers and tractor engine pistons are but two of the many light, strong, durable castings designed, developed and manufactured by Thompson for a diversified list of customer uses. Today Thompson is producing light metal castings for such products as buses and garbage disposers; washing machines and jet planes; automobiles and industrial engines; ice scoops and aircraft engines.

Behind this ability to aid all forms of industry are over 50 years experience in research and manufacture of precision metal parts. Regardless of your product, if you use castings, Thompson's creative engineers will gladly show you where and how you can simplify your operations and save on costs with Thompson Light Metals Castings.

For a detailed description of the Thompson Light Metals facilities which are available to you, send for your free copy of "Creative Castings." Just write to Dept. A-2, Light Metals Division, Thompson Products, Inc., 2269 Ashland Road, Cleveland 3, Ohio.

You can count on

Thompson Products

LIGHT METALS DIVISION
2269 Ashland Rd. • Cleveland 3, Ohio

so notified. If the steel is accepted, the inspector paints a green stripe adjacent to the original red one. This designates the steel is "OK for use." In the case of stainless steel a blue "OK" is attached to each coil.

The following is a list of the equipment in the laboratory and what it is used to determine: Baldwin Tensile Tester—yield strength, ultimate strength, yield tensile ratio, elongation (in two in. gage length), stretcher strain characteristics, whether killed or rimmed steel.

Rockwell hardness tester—"B" hardness, "S-30T" superficial hardness.

Olson cup tester—Drawability, directionality, grain size (approximate), stretcher strain characteristics.

Other standard tests—spark test for carbon, artificial aging test, zinc-plate thickness test.

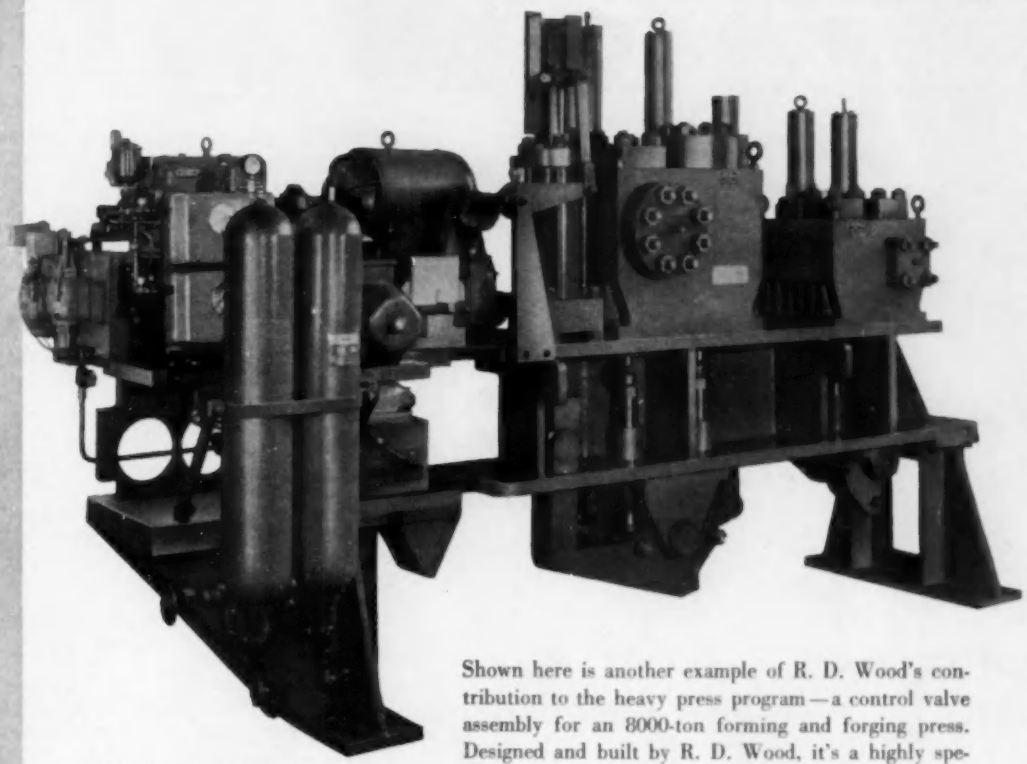
Several test bars may be pulled or several readings taken from the same sample. Tensile test bars are taken both with and across the direction of rolling. All such information is recorded for conciseness on a "Steel Test Report." These reports are filed so that at a latter date it is possible to look up the information on any particular heat number of any vendor.

At this point, a statistical quality control approach is employed to better display, summarize, and analyze the data obtained from the various tests made on critical job material. The information from the "Steel Test Report" is plotted onto a series of eight histograms contained on one sheet. These items are gage, yield strength, ultimate strength, yield/tensile ratio, elongation, hardness, spark test, Olsen cup test.

In order to increase the material operating range of the tools on all tough parts, a new approach known as the "tool and die tryout stock program" is being used. While a new die is being made, the engineer submits a request to the Steel Inspection Department for some tryout steel of a certain type which he considers necessary to make the part. If everybody concerned is in agreement with the engineers choice as to the type of steel, then Steel Inspection submits material to the tool vendor with physical properties on the low side of what can be expected for that type of steel.

It is necessary for us to employ the services of several processing warehouses. Here, at these sources, steel is delivered from the mill in our

Big help in heavy press program



Remote electro-hydraulic servo control valve assembly. Length is 14 feet; height 9 feet.

Shown here is another example of R. D. Wood's contribution to the heavy press program—a control valve assembly for an 8000-ton forming and forging press. Designed and built by R. D. Wood, it's a highly specialized type. It indicates R. D. Wood's ability to handle the most difficult valve engineering and manufacture.

Other standard R. D. Wood high-pressure hydraulic valves include stop, operating, check, relief, and safety types. Since 1803, the name R. D. Wood has stood for superior products. Write for details on R. D. Wood high pressure hydraulic valves for every purpose.

R. D. WOOD COMPANY

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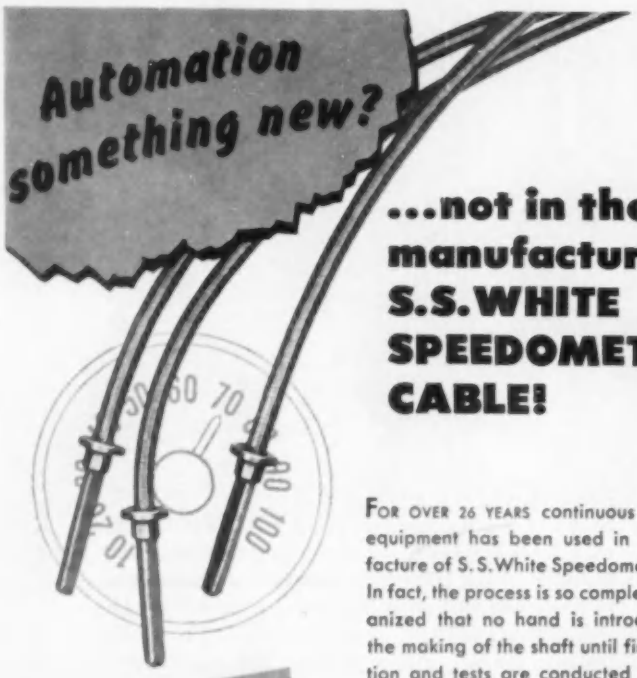
MAKERS OF HYDRAULIC PRESSES AND VALVES · FIRE HYDRANTS · CAST-IRON PIPE · GATE VALVES · GAS PRODUCERS · ACCUMULATORS

name, stored, and finally slit and sheared according to our needs. There is a steel inspector stationed at each such warehouse and his duties are similar to those of the inspector in the plant, with respect to obtaining steel samples. However, in addition, he is required to keep close check on the surface condition of the steel coils as they are unwound in slitting and shearing, and to reject the coils if they appear too defective for use.

As the coils are being fed into the rolling mills and progressive dies, or the cut lengths are placed into the blanking presses, inspection is still carried on. At this stage, the floor inspectors in the various fabricating departments spot check the surface condition and gage of the steel. Gage-thickness readings are plotted by the floor inspector directly onto a chart posted near the job.

The above is an abstract of a paper given at the 1954 Annual Meeting of The American Society of Mechanical Engineers in New York City.



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FOR OVER 26 YEARS continuous automatic equipment has been used in the manufacture of S.S.White Speedometer Cable. In fact, the process is so completely mechanized that no hand is introduced into the making of the shaft until final inspection and tests are conducted under formal quality control procedures.

Automation is thus responsible for cable in which tension is controlled and held to close limits and is one of the factors that contribute to the outstanding performance characteristics and quality of S.S.White Speedometer Cable. It's just one more reason why you, as an automotive manufacturer can specify S.S.White Cable with confidence from your speedometer supplier.

S. S. WHITE "FIRSTS" have meant better, more economical speedometer cable

FIRST to pioneer the use of flexible wire wound cable.

FIRST to introduce automation in speedometer cable manufacturing.

FIRST to develop machines for accurately cutting speedometer cable.

FIRST to introduce integral drive squares.

FIRST to develop satisfactory swaging equipment for speedometer cable.

FIRST to develop small diameter, thin wall speedometer casing.

FIRST to introduce galvanized coatings for speedometer service.

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FIRST NAME

S.S.White

in flexible shafts for speedometer drives, industrial power drives and remote control.

AI TABLOID

(*Continued from page* 189)

Fruehauf Trailer Co. has announced a new stainless steel Volume Van and a tank trailer.

* * *

Jones & Laughlin Steel Corp. has disclosed plans for a $50 million expansion program.

* * *

Sales and service functions of Consolidated Engineering Corp. and its wholly owned subsidiary, Consolidated Vacuum Corp., have merged their marketing activities.

* * *

Cornell-Dubilier Electric Corp. has formed a new Printed Wiring Div.

* * *

Douglas Aircraft Co., Inc., is reportedly planning to build both jet and turboprop transports . . . Curtiss-Wright Corp. is said to be considering the establishment of an experimental plant in North Central Pennsylvania.

* * *

Boeing Airplane Co. has formed a new bomber weapons unit.

* * *

Temco Aircraft Corp. is building a $500,000 addition to its Garland, Tex., plant . . . Allis-Chalmers Mfg. Co. is undertaking sizable expansions of its Terre Haute, Ind., and Gadsden, Ala., works . . . Firestone Tire & Rubber Co. is launching a $1.2 million expansion and improvement program at two synthetic rubber plants being purchased from the Government.

* * *

Longren Aircraft Co. plans to produce single-engine passenger and crop dusting planes in Mexico.

* * *

Beech Aircraft Corp., under a working agreement with Morane-Saulnier Co. of France, is planning to offer a twin-jet, four-place executive type plane made by the latter.

* * *

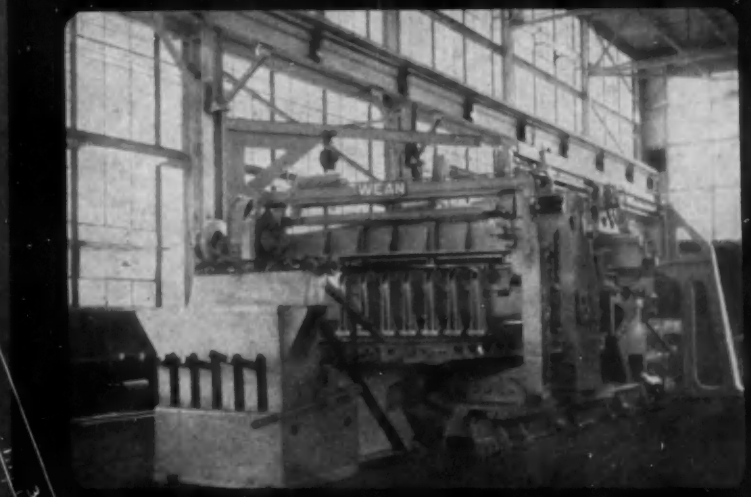
E. W. Bliss Co. has established a Die Supply Div. to replace the former Die Supply Co., which it acquired in 1953.

* * *

Globe Hoist Co. has opened the new plant and sales offices of its West Coast Div. at Long Beach, Calif.

need an idea?

Wean Trapezoidal Shear Line Solves Problem for Auto Maker



The Wean Trapezoidal Shear Line was developed as an answer to the high speed blanking of irregularly shaped pieces in the broad range that can be described as trapezoids or parallelograms. This use reduces tremendously the cost of expensive die setup in major blanking presses. Two pieces are made at each index with the accuracy that can only be achieved by a measured length indexing system. The cut can range from 45° to 90° angles. The latter setting establishes the line as a straight cut-up unit with twice the normal production of conventional shear lines. At Wean, we consider this line as another important step forward in our policy of cost reduction through progressive engineering. People in the automotive and metal fabricating fields have come to look more and more toward Wean Equipment for spectacular advances in machinery for metal processing.

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If service conditions are unusually rugged and you're troubled by high manufacturing costs—look to pearlitic malleable castings!

Pearlitic malleable has high fluidity that casts easily into complicated shapes. It resists wear under heavy loads at high speeds . . . has high ultimate strength . . . possesses excellent non-seizing properties for bearing surfaces . . . can be given a very smooth finish where desired . . . and can be either liquid quenched or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

So look your product over critically. Then check pearlitic malleable castings. They can replace more expensive methods of fabrication or manufacture . . . can lead to reduced weight, less machining time . . . fewer assembly operations . . . *greater sales appeal for your product.* AA-166

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY
Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

PROGRAM of MATERIALS HANDLING CONFERENCE

(*Continued from page* 80)

Panel C (10:30 a.m.-12 noon) **Analyzing the Materials Handling Problem: Its Relationship to Plant Layout, Production and Production Controls.** Moderator: Prof. Byron Saunders, chairman, college industrial committee, College of Engineering, Cornell University, Ithaca, N.Y. Speakers: **"Methods for Cost Control of Materials Handling."** Col. John B. Day, School of Industrial Engineering, Georgia Institute of Technology, Atlanta, Ga. **"Packard Motor Car's Materials Handling Problem."** John Andersen, materials handling engineer, Packard Motor Car Co., Detroit, Mich. **"Approach to a Materials Handling Problem."** Richard H. Weingartz, Kendick Corp., Moline, Ill.

Panel Members: Jack Christensen, industrial engineer, department head, Reliable Electric Co., Chicago; Wilbur D. Warner, national manager, materials handling division, Sears Roebuck & Co., Chicago; Douglas A. Gillespie, distribution engineering department, Northern Electric Co., Ltd., Montreal, Que.

Afternoon Panel Session, Panels A, B and C. (1:30-3 p.m.) All panel participants in a joint session to insure answers for all questions.

WEDNESDAY, MAY 18

Panel D (9 a.m.-12 noon) **Integrating the Materials Handling System with Plant Facilities.** Moderator: Norman B. Shikes, manager of materials handling, Radio Corp. of America, Camden, N. J. Speakers: **"Problem of Old and Multi-Story Buildings."** James R. Bright, Graduate School of Business Administration, Harvard University, Boston, Mass. **"Integrating Two-Way Radio with Modern Plant Facilities."** Harry Boyle, products department, communication division of engineering, Radio Corp. of America, Camden. **"New Building Design for Modern Handling Equipment."** Edward J. Slygh, project engineer, Campbell Lowrie Lautermilch Corp., Chicago.

Panel Members: Les Seversen, warehouse and shipping supervisor, Central Scientific Co., Chicago; John R. Wells, Jr., materials handling engineer, Glenn L. Martin Co., Baltimore, Md.; James J. McCabe, chief industrial engineer, American Maize Products Co., Roby, Ind.

Panel E (9-10 a.m.) **Materials Handling from Origin to Destination.** Moderator:
(*Turn to page* 200, *please*)

for many industrial filtering jobs

New Honan-Crane ...Full Flow Filters

give you EXTRA HIGH Flow Rates —25 to 900 GPM!

plus

these time and money saving features

GREATER FILTERING EFFICIENCY . . . Designed for in-line installation. Every drop of oil or coolant in the system gets continuous filtration . . . solid particles down to micronic size (one micron = 0.00004 inch) are removed.

LARGE DIRT HOLDING CAPACITY . . . Uses remarkable new "Flo-Pac" Cartridge—a product of two years' research. Cartridge contains 44 square feet of filtering surface . . . has exceptionally long life.

RUGGED CONSTRUCTION . . . Built of heavy gauge steel for heavy-duty service with a minimum of upkeep. No moving parts. Special cover and cartridge gasket seals eliminate leakage and by-passing.

SIZES TO MEET ALL FLOW REQUIREMENTS . . . The Honan-Crane Full Flow Filter is available in nine compact models using one to 36 "Flo-Pac" Cartridges. Flow rates range from 25 to 900 GPM to provide "custom" filtration in any application, large or small.

QUICK OPENING COVERS . . . Covers are fastened by swing bolts which can be loosened in seconds. Larger models have unique lifting device that swings cover to one side for easy access to cartridges.

FULL FLOW SOLVES MANY FILTERING PROBLEMS

New Full Flow Filter can be used on lube and fuel oils, industrial cutting oils and coolants, solvents, washing solutions and similar liquids. Completely inert "Flo-Pac" cartridge will not remove additives or inhibitors. Ideal for water based solutions . . . will not soften or disintegrate in water.

WRITE TODAY for colorful 8-page Equipment Bulletin 101 giving full details.

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HOUDAILLE-HERSHEY OF INDIANA, INC.

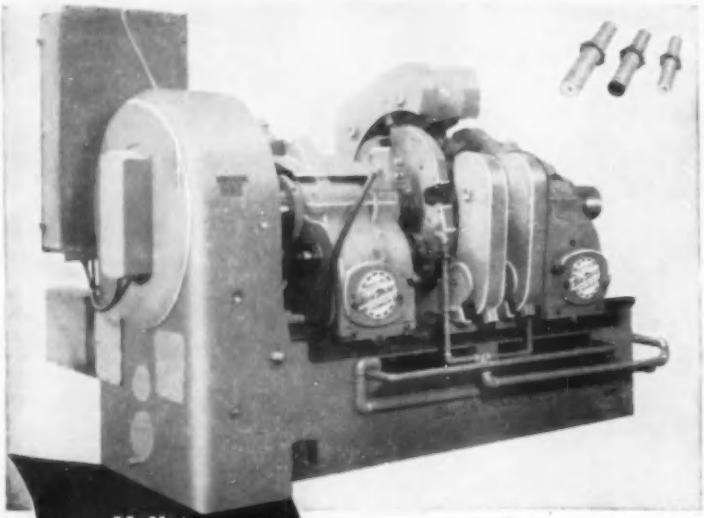
FILTRATION DIVISION

General Electric Co. Proposes Novel Atomic Reactor Design

Two General Electric Co. atomic experts have proposed an atomic reactor design which reportedly promises to remove many obstacles to the use of atomic power plants in aircraft, locomotives, and ships. The design is said to more than halve the weight per horsepower of conventional atomic reactors and to eliminate many moving parts that are standard in such equipment.

The liquid metal reactor design "nests" the reactor inside a cylindrical heat exchanger. This arrangement, it was explained, eliminates the separate heat exchanger used to convert water into steam to drive turbine-generators. In so doing, it reportedly eliminates much piping, valves, and open space which must be shielded to protect personnel from radiation.

The space saving and simplification of the reactor are achieved in the GE design through use of electricity generated by temperature differences in the heat exchanger. It is contemplated that this source of power can be used directly to pump the liquid metal coolant.



Milling and Centering Simultaneously and in Continuous Production

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th ST. MILWAUKEE 16, WISCONSIN

PROGRAM of MATERIALS HANDLING CONFERENCE

(*Continued from page* 198)

John Bucuss, president, Acme Steel Products Division, Acme Steel Co., Chicago. Speakers: **"Use of Pallets from Origin to Destination."** William H. Sardo, Jr., secretary-manager, National Wooden Pallet Manufacturing Assn., Washington, D. C. **"Future of Materials Handling for the Railroads."** Edward J. Kehoe, consultant, office of the president, New York, New Haven & Hartford R.R., New Haven, Conn. **"Use of Rubber Balloons and Their Effect on Bulk Handling."** Addison Brown, president, O.T.D. Container Corp., Berwyn, Ill.

Panel Members: Edward H. Leighton, editor, "Flow," Cleveland, O.; Herbert H. Hall, materials handling engineer, Aluminum Co. of America, Pittsburgh, Pa.; John Velardo, packaging and shipping editor, "Flow," Cleveland; Leroy F. Skubic, president, Paltier Corp., Michigan City, Ind.

Panel F (11 a.m.-12 noon) **Yard Handling.** Moderator: Edward J. Kolk, general production manager, Major Corp., Gary, Ind. Speakers: **"Problems Encountered in Yard Operations."** Wade Meloan, sales director, Pettibone Mulliken Corp., Chicago. **"The Lumber Yard Unit Load Program for Most Effective Distribution."** John Moeling, president, Sterling Lumber & Supply Co., Chicago. **"Modern Methods as Applied to Scrap Metal Yard."** Norman Pinkert, Peoples Iron & Metal, Chicago.

Panel Members: Frank C. Wier, superintendent materials handling, Timken Roller Bearing Co., Canton, O.; Richard F. Bancroft, midwest advertising manager, "Modern Materials Handling," Chicago; J. D. May, customer service project engineer, U.S. Gypsum Co., Chicago.

Afternoon Panel Session, Panels D, E and F. (1:30-3 p.m.) All panel participants in a joint session to insure answers for all questions.

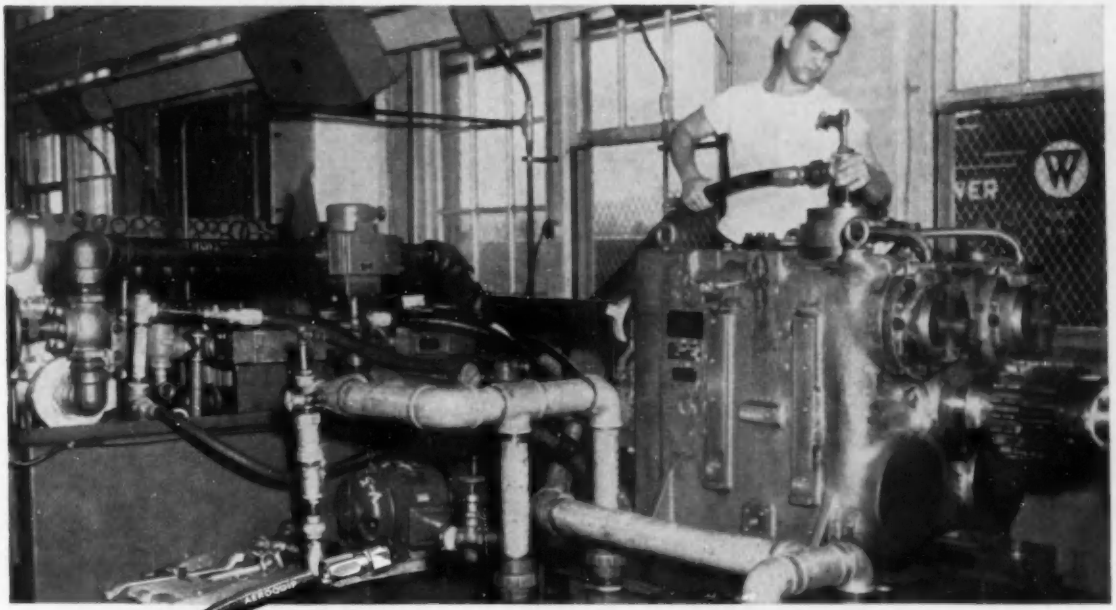
AUTOMOTIVE INDUSTRIES . . .

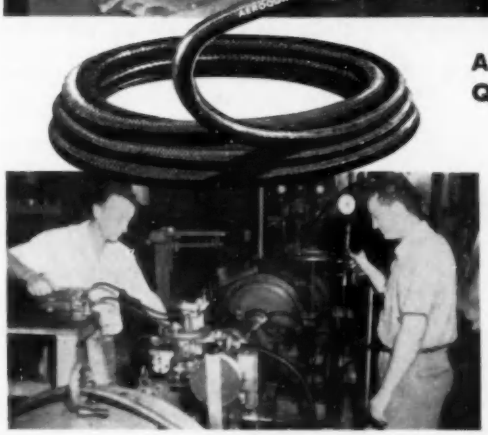
Is your News Magazine of Automotive and Aviation

MANUFACTURING

"Our Test Stand Hook-Up Time Has Been Reduced From Days To Hours"

SAYS HENRY LEGERE, *Hydraulic Test Foreman, Waterbury Tool Division of Vickers Incorporated*





Size 5 heavy duty transmission for cargo winch drive shown in a typical test stand hook-up. Notice how Aeroquip flexible hose lines are used to eliminate need for alignment.

AEROQUIP FLEXIBLE HOSE LINES INSTALL QUICKLY... ELIMINATE ALIGNMENT PROBLEMS

Pressures as high as 5,000 p.s.i. are encountered in the testing of hydraulic equipment produced by Waterbury Tool Division of Vickers Incorporated, Waterbury, Conn. Aeroquip hose lines meet all performance requirements, and make it possible for laboratory personnel to make test stand installations quickly and easily.

Henry Legere, Test Stand Foreman, reports that one installation, normally requiring four hours to form and fit piping, is accomplished in *5 minutes* when Aeroquip hose lines are used!

A supply of Aeroquip bulk hose and reusable fittings will help you three ways: (1) Cut inventory because you can make Aeroquip hose lines to required length in minutes; (2) Cut installation time because all alignment problems are eliminated; (3) Eliminate failures because Aeroquip hose lines are exceptionally tough and durable.

Write for complete information.

Aeroquip

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it's the **SEASONING**

that makes the **DIFFERENCE**

● Making both fasteners and friends for 100 years has given us the experience to supply your needs with the products... plus the service... that will make it a pleasure for you to do business with Buffalo Bolt. May we serve you?

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NORTH TONAWANDA, N. Y.
Making both FASTENERS & FRIENDS for 100 years

NEW ACCESSORIES

Oil Filter Kit

Oil filter kit 500-E for the Chevrolet V-8 has just been placed on the market by *Purolator Products, Inc., Rahway, N. J.* Requiring only a few minutes to install, this kit is complete with all necessary parts packed

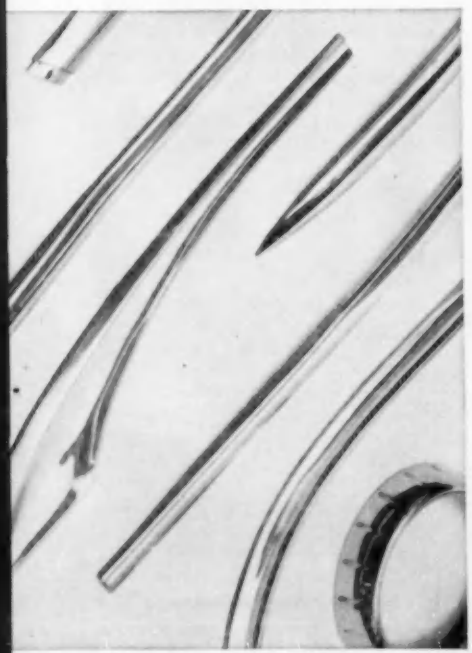
in one carton. It features the Micronic refill, and the "Dirt Check" window also instantly shows the refill's dirt load. This Micronic element resists channelling, unloading, warping or disintegration. Besides removing solid contaminants of micron size (0.000039 in.), it takes sludge, acids and water droplets out of the oil, yet leaves detergent additives undisturbed.

Supercharger

A supercharger kit for Ford and Mercury V-8 engines, 1950 to 1953, and a universal kit for engines of similar size has been introduced by *Judson Research and Mfg. Co., Conshohocken, Pa.* The model M-178 replaces the earlier model B-210. A positive displacement rotary vane type, it compresses the mixture adia-

(*Turn to page* 206, *please*)

He'd appreciate trim with **beauty that's more than skin deep**



IT'S A LOVELY DAY FOR GOLF. But tomorrow's Sunday and the ultimatum has been issued: "Get the car cleaned up."

But our hero still has a chance . . . if he's lucky enough to have a car that makes the fullest use of Stainless Steel trim. An ordinary car wash will leave it bright and sparkling; there'll be no laborious polishing. There may even be time for a quick nine.

When trade-in time comes, the trim—inside and outside—will still be sparkling . . . if it's Stainless Steel. That's because it's not just a surface beauty, but a beauty that can't be polished off.

Stainless Steel trim is a feature your dealers can sell and sell hard. For everyone knows what Stainless Steel is and what it does.

When you give your customers trim with "beauty that's more than skin deep," make it from USS Stainless Steel. This perfected, service-tested cold-rolled strip is available in a complete range of grades and finishes to meet your fabricating requirements.

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USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS USS PIPE · TUBES · WIRE · SPECIAL SECTIONS

S-28

UNITED STATES STEEL

Many Special Cars at Turin Show

(*Continued from page 53*)

three Ford V-8 models bearing the Simca nameplate.

Maserati added a new sports model, the 150 S, with a four-cylinder, overhead-camshaft engine of 3.18 by 2.83 in. bore and stroke (91 cu in.). It has a compression ratio of 8.75 to 1 and develops 130 hp at 7500 rpm. This follows the same general lines of construction as the bigger Maseratis, with high alloy tubular frame members, four speed transmission, coil springs in front and transverse spring at the rear. Wheelbase is 84½ in., tread 49 in., and weight with two passenger body, empty tanks and spare wheel, 1276 lb.

Custom bodies and prototype designs always have been a feature of the Italian show, but this year they were more numerous than usual. Within a few weeks of the Fiat big production 600 coming on the market, about half a dozen Italian body specialists were ready with special designs. Pinin Farina's special treatment of this had the usual windshield, with the rear glass sloping rearwards from the base upwards. Bumpers, front and rear, were completely wrapped right up to the fender edge and an impression of length was given by a waist-line chromium strip unbroken from tail light to headlight.

Working on the same model, Boano used a completely rounded windshield, with the American-type forward staggered column, the rear glass being practically identical with the front windshield. While louvres on the rear hood were sufficient to admit the necessary air to the rear engine, it was necessary, on some of the prototypes, to fit an air scoop on the fender, just back of the door. Hoods generally have a considerable downward slope, the fenders only rising above the hood level at the forward end, in which the headlights are recessed.

A Lincoln with a body by Boano, designated the "Indianapolis," featured three chromium-plated exhaust pipes in elevation just ahead of the door, and corresponding to this an air scoop, with similar chromium-plated trim on the forward edge of the door. Front windshield and rear glass were practically identical, and as the entering edge of the front fenders and the trailing edge of the rear fenders had the same oval treatment—head and side lights being set in the one and tail and stop lights in the other—the aspect was the same front and rear.

As an example of pure streamlining, Ghia, of Turin presented a full-sized model of a two-door, two-passenger closed car with considerable front and rear overhang, the hood sloping down to a blunt point, the sides merging into darts, with a sloping cut-off at the rear, from top to bottom. In accordance with general Italian practice, the body was constructed of aluminum panels on a steel frame.

The fin idea was developed by Pinin Farina with a special sedan on a Lancia chassis. It had two parallel fins, the inner and lower one tapering off the body, and the outer one terminating the fender line.

SPEED UP ASSEMBLY

of

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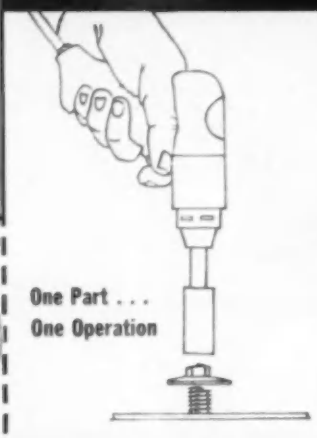
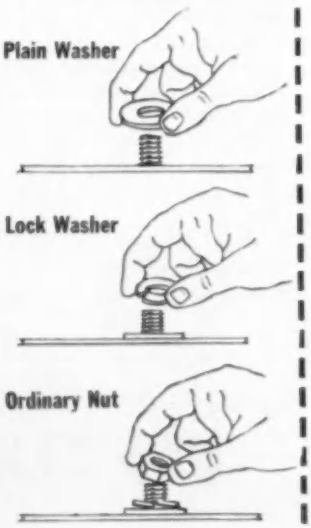
THIS



INSTEAD OF THIS

3 Parts . . . 3 Operations



REAL SAVINGS when Washer Type PALNUTS are applied to your mouldings, nameplates, medallions, deck handles, tail and parking lights, instrument mountings, etc. Also real security, due to live spring locking action. Popular thread sizes always in stock. State thread size and washer diameter or clearance around stud or bolt when requesting free samples.

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WASHER TYPE PALNUT TRADE MARK ® **LOCK NUTS**

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

Riss Buys 500 ROADRANGERS®

Riss & Company, Inc. of Kansas City, Mo., specified that every one of their new fleet of 500 tractors be *equipped with a Fuller Semi-Automatic R-950-C* ROADRANGER *Transmission.*

With *single*-lever control of all 10 forward speeds, the Fuller ROADRANGERS permit Riss drivers to *anticipate grade requirements* and meet them with the right ratio at the right time. The ten closely spaced ROADRANGER gear ratios can be readily anticipated and rapidly engaged, without having to wrestle with gear splits or wait for automatic actuation. And with all forward ratios in even 28% steps, they can match power precisely to load and grade demands and at the same time save fuel by keeping the engine operating in the maximum horsepower range.

• • •

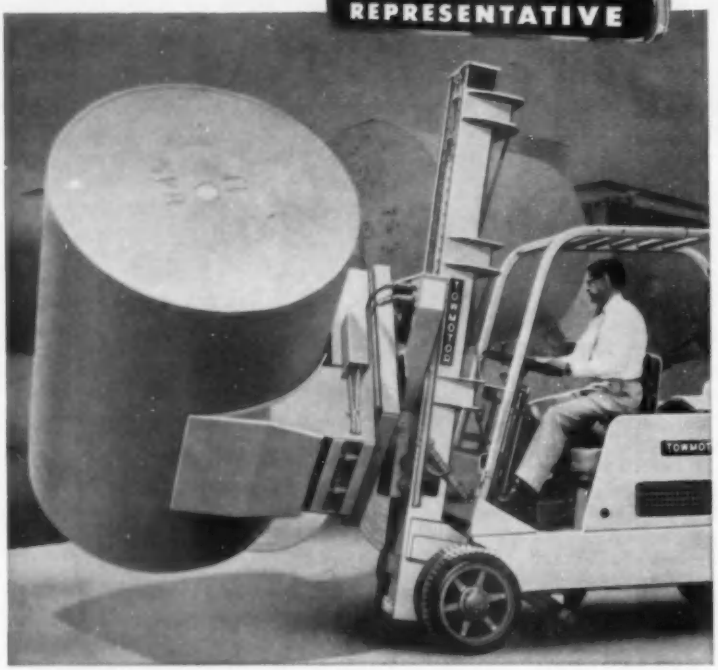
For the most efficient, easiest-shifting transmissions available today . . . *specify Fuller Semi-Automatic* ROADRANGERS *for your fleet!*

FULLER MANUFACTURING COMPANY
(Transmission Division) Kalamazoo, Mich.

Unit Drop Forge Div., Milwaukee 1, Wis. • Slater Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

THE SIGN OF
SUPERIOR SERVICE
. . . coast to coast

TOWMOTOR
THE ONE-MAN-GANG
FORK LIFT TRUCKS
YOUR TOWMOTOR
REPRESENTATIVE



New TOWMOTOR Roll Clamp upending multi-ton paper roll

FAST
DEPENDABLE
SERVICE
when you need it!

Every Towmotor fork lift truck is designed to stay on the job longer. However, abuse, or years of service eventually make repairs necessary. That is when Towmotor's easy service accessibility pays off. Each Towmotor Representative is a materials handling specialist who backs up the Towmotors he sells with the most efficient and complete service facilities in the field. Talk to him about the advantages of Towmotor 3-way Service. See your Towmotor Representative today, and write for complete service information. TOWMOTOR CORPORATION, DIV. 4505, 1226 E. 152nd St., Cleveland 10, Ohio.

FOR SUPERIOR SERVICE
CALL YOUR LOCAL TOWMOTOR
REPRESENTATIVE

TOWMOTOR FORK LIFT TRUCKS AND TRACTORS SINCE 1919

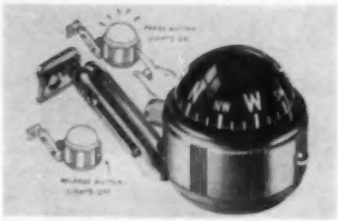
New Accessories

(*Continued from page 202*)

batically. It is driven from the crankshaft with two standard V-belts. Vanes on the eccentric rotor move in and out of the rotor within the housing, as well as rotate. Vanes are nonmetallic, and move on a film of oil supplied by automatic lubrication device. Boost is five psi.

Compass

This auto compass features illumination entirely self-contained, with a finger-tip flash cell built right into



its case. With no wires to attach, the self-illuminated auto compass is completely independent of the regular car power system. *Airguide Instrument Co., Chicago 47, Ill.*

Signal Switch

A universal directional signal switch unit specially designed for heavy-duty service on buses, trucks and trailers is now being marketed by the *Auto Lamp Manufacturing Co., 2909 Indiana Ave., Chicago 16, Ill.* Made with a built-in pilot light, the switch fits any size steering column and operates all standard six and 12-volt directional signals. Listed as No. 550 in the new Pathfinder catalog, the switch comes ready for installation complete with bulb, harness, plastic tipped handle and Tungsol flasher. No. 4W-550 incorporates a built-in throw-over switch which operates all four signals simultaneously.

Dump Hoist

A new hydraulic hoist, designed for installation on ½, ¾ and 1-ton trucks, is announced by *The Galion Allsteel Body Co., Galion, Ohio.* Known as Model 334N, the new hoist can be mounted under any pick-up body, as well as any platform body up to nine ft in length or light duty Galion Allsteel dump body up to eight

(*Turn to page 208, please*)

This leadscrew "leads" a double life!

Two views of the Lodge & Shipley Hollow Spindle leadscrew show reversibility feature.

No need to replace the leadscrew of your Lodge & Shipley Oil Country Lathe if it eventually becomes worn on the head end. Simply reverse the leadscrew, end for end, for renewed accuracy.

On an Oil Country Lathe, most of the work is done close to the spindle nose. As a result, the greatest wear occurs at the headstock end. Lodge & Shipley's unique reversible feature provides real savings by doubling leadscrew life.

It's one of the many reasons why the versatile Lodge & Shipley Oil Country or Hollow Spindle Lathe is in demand far beyond the oil fields. Equally efficient for very long pieces chucked through the large hole in the spindle, or for normal between-centers work, it saves capital investment and floor space. And, the two-speed tailstock makes drilling large holes easier.

Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

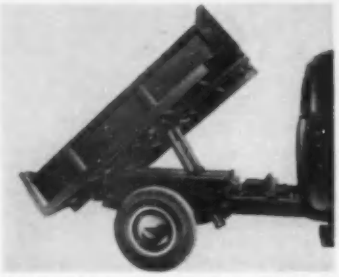
LODGE & SHIPLEY HOLLOW SPINDLE LATHES

Lodge & Shipley *....your* LODGE-*ical choice!*

New Accessories

(Continued from page 206)

ft long. Rated capacity of the hoist is up to four tons, depending on body length and pivot, the manufacturer states. Suitable for installation on trucks having cab-to-axle dimensions of 46 to 60 in., Model 334N provides a dumping angle of 40 deg. Location of the twin three-in. ram-type hoist cylinders ahead of the truck's rear axle is reputed to afford maximum



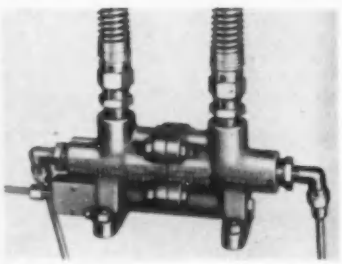
lifting efficiency. Mounting height is reduced to four in. with wheel housing-type bodies on standard three-in. structural steel channel longitudinals. Structural steel angle longitudinals are also available to provide even lower mounting height when body crossmembers are notched out and angle longitudinals are welded in.

Winch

A new lightweight, compact hydraulic winch has been developed by *Tulsa Winch Div. of Vickers, Inc., Tulsa, Oklahoma.* This unit can be installed in almost any location and controlled remotely as the power source can be located at a distance from the winch. This eliminates rigid drive shafts, pillow block bearings, sprockets, chain and levers. It can be installed on trucks and other vehicles where power take-off openings are not available. Basic advantages are the precise control of loads and the elimination of shock-loading.

Trailer Valve

An automatic tractor-trailer breakaway valve is designed to conform with I.C.C. Regulation 193.43. This valve will automatically seal off the towing vehicle's air lines should the trailer break away or the connecting lines be severed. Another advantage of this breakaway valve is that the operator can charge the trailer air lines without leaving the cab, using a



hand control on the instrument panel. This is done every time a new trailer hook-up is made. The same control can be used to apply the trailer emergency brakes, either in an emergency or as a fool-proof method of parking on a grade.

The Robinson Breakaway Valve has only two moving parts, and no diaphragms. It requires no secondary tank or check valve, and no extra piping. Trailer hoses connect directly, eliminating the shut-off cocks. *Robinson Products, Inc., 16550 Wyoming Ave., Detroit 21, Mich.*

ONLY A FEW SURVIVE A CENTURY
SHIPPING THEM SUPERSTRONG MADE CONTAINERS
1855 - 1955
100 YEARS
There are not many in the business world able to surmount the changing events of one hundred years—wars, panics, depressions, economic turmoil. To do so, a company must maintain and perform services which engender loyal and friendly customer relations.
It is therefore with deep satisfaction that we mark our first centennial. You have helped to make it possible—and we extend our sincere thanks.
RATHBORNE, HAIR AND RIDGWAY BOX CO.
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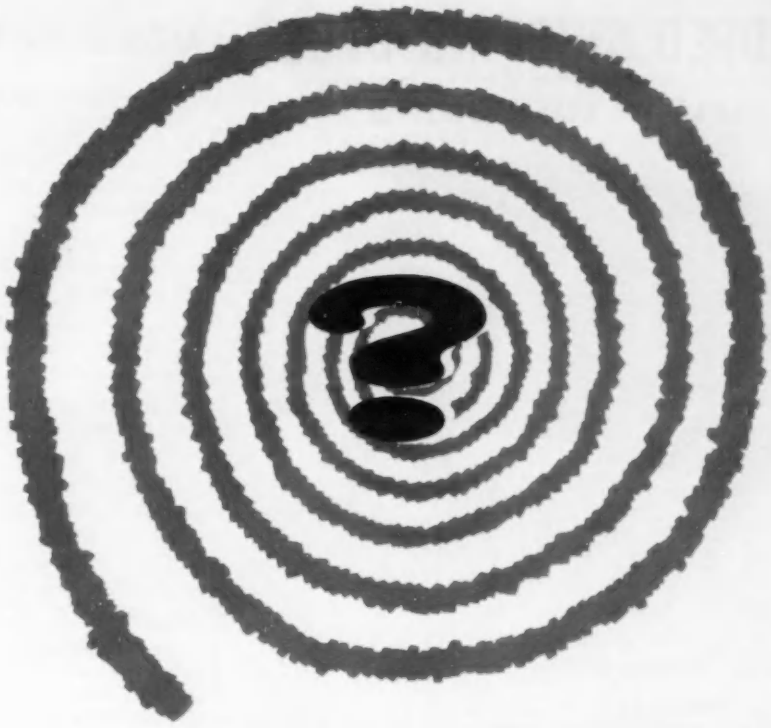
Executives read
AUTOMOTIVE INDUSTRIES



WHICH CAUSES MOST AUTO ACCIDENTS?

- ◯ PUNCTURE OR BLOWOUT
- ◯ DEFECTIVE STEERING
- ◯ DEFECTIVE BRAKES
- ◯ DEFECTIVE TAIL LIGHT
- ◯ DEFECTIVE HEADLIGHTS

(Check one of these before reading further.)

If you checked brakes, you're right. Insurance statistics show that defective brakes are responsible for more than twice as many auto accidents as any of the other causes.

Better brakes can prevent many of these accidents. Better brakes can save lives. Auto Specialties Double-Disc Brakes are better brakes. They're ready for passenger cars now.

They can stop cars quicker, safer, smoother . . . and in shorter distances. They give the same amount of braking every time the same pressure is applied to the pedal. They are predictable and uniform in their performance. You always know what they are going to do. They have "built-in", self-energized power that is not dependent on the efficiency of boosters, tanks, tubing, diaphragms, etc. They don't lose effectiveness because of roadspray, water, freezing or dust.

And this life-saving accident prevention . . . this safe-and-sure stopping . . . continues as long as you drive a car equipped with Auto Specialties Double-Disc Brakes. Because these better brakes have an *automatic* adjuster that keeps them in perfect condition always. And they rarely need relining.

But Auto Specialties Double-Disc Brakes do more than prevent accidents. They can create a new kind of motoring. Worry-free, relaxed, restful, enjoyable driving and riding . . . that results from knowing that they are the smoothest, surest, straightest stopping brakes engineers have yet devised.

Auto Specialties Self-Energized Double-Disc Brakes have passed the severe testing of major car factories. Their cost is comparable to that of present automotive brakes. Their adoption will be in keeping with increased horsepower and speed and with the industry's continuing desire to give the American motorist better, safer and more pleasant means of transportation.

For more information about these brakes, write:

AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Mich., and Windsor, Ont., Canada

Manufacturing for the automotive and farm machinery industry since 1908

JIFFY PADDED SHIPPING BAGS

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THE COMPLETE SHIPPING UNIT FOR { SMALL PARTS
TOOLS
ACCESSORIES
UPHOLSTERY SAMPLES
...AND OTHER
NON-FRAGILE PRODUCTS

- SAVE OVER 76% PACKING TIME.
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- 9 STANDARD SIZES.
- DISTRIBUTORS IN PRINCIPAL CITIES.

JIFFY MACERATED PAPER PADS AND BLANKETS { Packing protection for fenders, bumpers, etc.
Flexible—ideal for odd shaped objects.
Non-abrasive.
Low cost.

KUSHION-KRAFT { For highly finished surfaces of precision parts.
Composed of layers of rugated kraft, facial tissue or varying combinations of both.
The thickness and strength of the material is controlled by the number of plies and type of paper used.

JIFFY MANUFACTURING COMPANY
HILLSIDE, NEW JERSEY

JIFFY MANUFACTURING COMPANY, HILLSIDE, N. J.

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☐ JIFFY PADDED SHIPPING BAGS
☐ MACERATED PAPER PADS AND BLANKETS
☐ KUSHION-KRAFT

NAME_____

TITLE_____ COMPANY_____

STREET_____

CITY_____ STATE_____

MEN *in the* NEWS

(*Continued from page* 45)

De Soto Div. — Chrysler Corp. — **R. M. Rowland** has retired as director of merchandising.

Chrysler Corp. of Canada—**R. J. Lyons** has been chosen director of forward planning.

General Controls Co., Industrial Controls Div.—**Sumner Ladd** has been appointed manager.

Metal & Thermit Corp.—**Merritt L. Smith** has been appointed executive advisor.

General Electric Research Laboratory—**Ned Landon** is now manager of public information.

Link-Belt Co.—**Arthur E. Maha** has been appointed sales manager of the Dodge plant.

General Electric Co., Aircraft Gas Turbine Div.—**James N. Krebs** has been named manager of the Development Engine Section of the Development Dept.

Amthor Testing Instrument Co.—**Albert Tintner** is now general sales manager.

All American Engineering Co.—**Donald B. Doolittle, Malcolm McAlpin,** and **Vincent A. Theisen** have been named directors.

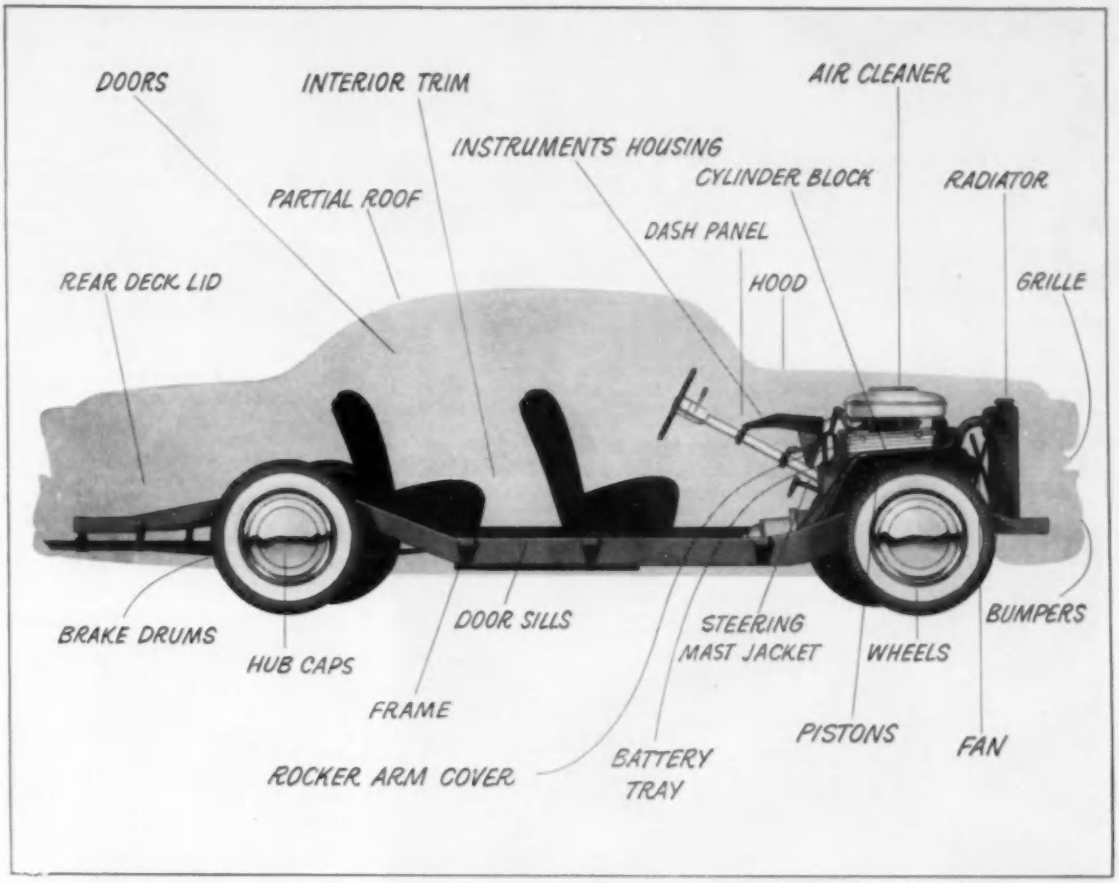
Mont Clare Mfg. Co.—**Ben D. Berk** has been named general sales manager.

Perfection Industries, Inc., Engineering Div.—**Richard Spooner** is now chief of the Automotive and Contract Section.

Allegheny Ludlum Steel Corp.—**C. B. Boyne** has been named director of customer service; **Roger S. Ahlbrandt,** executive assistant to the vice-president in charge of sales; **F. Price Norris,** director of stainless and specialty steel sales; and **W. R. Yingst,** coordinator of production control.

Lincoln-Mercury Div., Ford Motor Co.—**J. Emmet Judge** was named manager of the new Merchandising and Product Planning office; **W. J. Moriarty,** Mercury planning manager; **R. E. Donley,** product programming manager; **C. B. Pfeiffer,** manager of the Product and Competitive Analysis Dept.; and **M. H. Lieblich,** manager of the Economic Studies Dept.

(*Turn to page* 212, *please*)



PREDICTION: ALL THESE PARTS WILL BE MADE OF ALUMINUM!

We believe that, in the near future, the use of aluminum for the 22 parts shown here will become as accepted by automotive engineers as the aluminum piston is today. In fact, we believe it's quite possible that eventually hundreds of parts will be made of aluminum.

We base this prediction on three factors.

Availability—Aluminum is now in abundant supply due to the vast expansion of the aluminum industry. You can plan to use aluminum with the assurance of continuing, dependable supply in any quantity or form you require.

Better parts—These parts will give better performance when made of aluminum because aluminum offers a *combination of advantages* no other material can match. For example, lightness, corrosion resistance, ability to deep draw on such items as battery trays mean a better product and faster, economical production.

Aluminum's lightness alone contributes to faster pickup and climb, more miles per gallon, and can lower the center of gravity. In addition, aluminum offers other advantages such as strength, heat conductivity, light and heat reflectivity.

Fabricating economy—Aluminum's workability makes it easy to fabricate often at far less cost than other materials. It can be stretched, rolled, cast, drawn, forged, spun, stamped, extruded, and machined to make a wide variety of parts economically. And aluminum gives you a big price savings over other non-ferrous metals, because its light weight gives you up to three times more metal per pound.

Next time you are designing a part, stop and think—can it be better made with aluminum?

As America's fastest growing producer of aluminum, we believe we are ideally equipped to work with you. For complete information, contact any Kaiser Aluminum sales office listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Ill.; *Executive Office*, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

MEN *in the* NEWS

(*Continued from page* 210)

Edgcomb Steel & Aluminum Corp.—**George L. Tillson** has been named chairman of the board, and **Harry L. Edgcomb** has been made president.

Chrysler Corp., Central Engineering Div.—**Max W. Johnson** is now supervisor of the personnel development office.

Ford Motor Co.—**Lawrence M. Corrigan** has been chosen manager of industrial relations for the Buffalo stamping plant.

National Lead Co.—**Carlton H. Rose** has been made director of public relations.

Westinghouse Electric Corp.—**T. P. Jones** has been named assistant manager of the Atlantic region; **T. E. Stieber**, Philadelphia district manager; and **Robert N. Anderson**, electric utility manager, Atlantic region.

Wagner Electric Corp., Automotive Div.—**B. M. Moncrief** is now manager of the Dallas branch, and **J. L. Crain, Jr.**, has become manager of the Denver branch.

Foxboro Co.—**C. C. Fuller** has been appointed vice-president; **H. O. Ehrisman**, general sales manager; and **J. J. Burnett**, field sales manager.

Nopco Chemical Co., Plastic Div.—**Benjamin S. Collins** has been named chief development engineer.

Ohio Seamless Tube Div., Copperweld Steel Co.—**Wallace B. Leyda** has been made chief metallurgist.

Chrysler Corp.—**Lambert J. LaPorte** has been named general superintendent of Automotive Production Dept. at the Los Angeles plant.

General Electric Co.—**C. Howard Black** has been appointed general manager of the Construction Materials Div., and **Edwin E. Parker** succeeds him as general manager of the Instrument Dept.

Globe-Union, Inc.—**Kenneth R. Patterson** has been appointed battery application engineer.

Wagner Electric Corp., Automotive Div.—**Raymond R. Comiskey** is now manager of the Detroit Automotive Service Branch Office.

Kendrick Mfg. Co.—**Roy A. Johnson** has been made midwest manager of sales.

General Motors Corp.—**D. C. Wilkerson** of the GM Engineering Staff has been named chairman of the Michigan Patent Law Association committee for U. S. Patent Office Cooperation.

Press Automation Systems, Inc.—**Maurice M. Clemons** has been named president while **Jack Young** is now vice-president and director.

Minnesota Mining and Mfg. Co.—**Dr. B. J. Oakes** was named general manager of a new chemical products group.

George L. Nankervis Co.—**Delavan Lee** has joined the sales-engineering staff.

Purolator Prolator Products, Inc., Equipment Sales Div.—**Richard T. Karr** was appointed general sales manager.

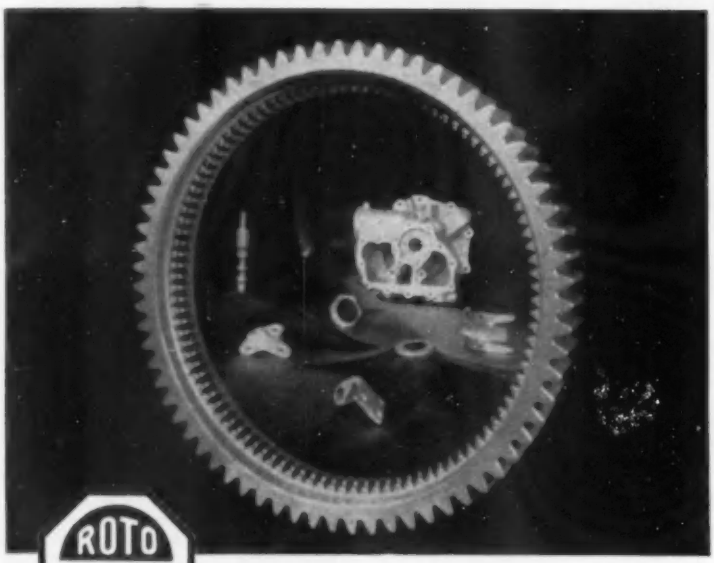
Firth-Loach Metals, Inc.—**Harold O. Warnock** was named chief plant engineer.

Joy Mfg. Co.—**Louis G. Helmick, Jr.**, has been elected vice-president of manufacturing.

Marquardt Aircraft Co.—**A. M. Davis** is now chief of engineering and manufacturing services.

Kaiser Metal Products, Inc.—**William D. Craddock** has been placed in charge of stainless fabrication.

(*Turn to page* 214, *please*)



it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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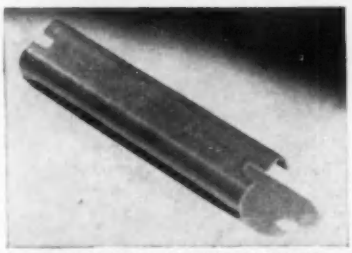
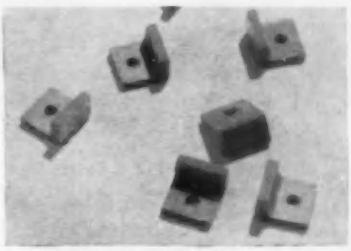
3713 Milham Road, Kalamazoo, Michigan
Originators of the Roto-Finish Process

P. O. Box 988
Phone 3-5578

C-D-F MACHINES TO CLOSE TOLERANCES.
Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



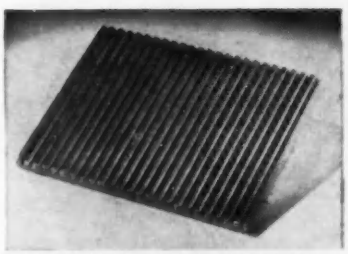
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



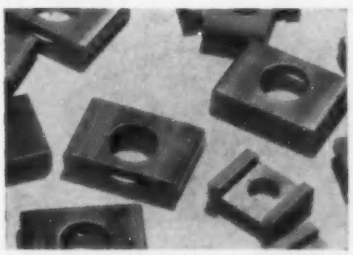
C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

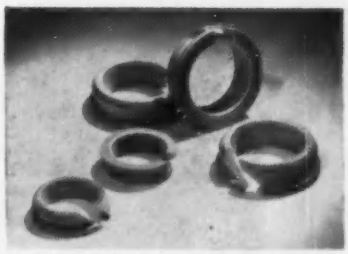
Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 2, DELAWARE

How Federal Helps Whirlpool

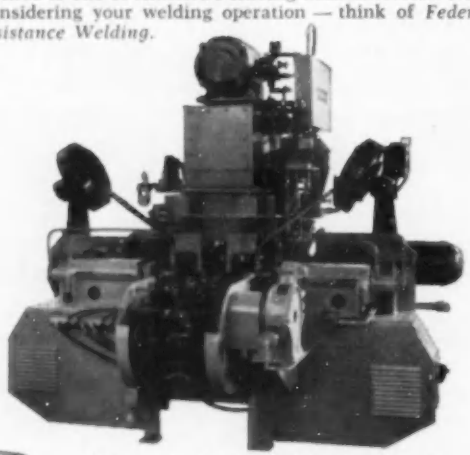
BUILD BETTER HOME LAUNDRIES

Mills, Welds, Tests
1,000 Washer Parts per Hour!

A special resistance welder designed by Federal is helping Whirlpool build better home laundries, faster at reduced costs.

It is believed to be the first machine to combine a milling operation with resistance welding. It also assembles three parts and performs a 100% test — completing 1000 finished assemblies per hour with one operator.

The assembly is a tub suspension rod, and is comprised of a length of rod, a bracket and two metal discs. The operator fits the bracket over the rod and drops it into a hopper — the machine does the rest. It carries the rod to a milling station where the rod ends are machined to proper radius for best projection welding. The two discs are hopper fed to the ends of the rod at the welding station. After welding the parts are automatically transferred to a test station where each assembly is given a 3000 pound "pull test." This is another example of how Federal's "know how" in resistance welding is paying dividends to one of America's leading manufacturers. Next time you're considering your welding operation — think of *Federal — First in Resistance Welding.*



Neat, compact Federal resistance welder that speeds production of tub suspension rods for Whirlpool.

Federal WELDERS
Warco PRESSES

The Federal Machine and Welder Company
WARREN, OHIO

MEN *in the* NEWS

(*Continued from page* 212)

Flexonics Corp.—**George G. Toepper** has been elected vice-president in charge of manufacturing, and **Thomas K. Wells** has been made vice-president in charge of sales.

Exide Automotive Div., Electric Storage Battery Co. — **Thomas G. Tynan** was advanced to sales manager.

Cross Co.—**Herbert M. Shilson** and **Kurt O. Tech** have been elected to the board of directors.

Royal Aircraft Co.—**Max I. Black** has been named sales manager.

American Wheelabrator & Equipment Corp.—**Leslie L. Andrus, Harold M. Miller,** and **Ray P. Whitman** were elected to the board of directors.

Westinghouse Electric Corp.—**Thurman L. Rundlett** is now assistant planning director for new products.

Jarvis Corp.—**H. W. McMeken** has been appointed director of technical advertising and public relations.

Cleveland Instrument Co.—**C. Thorpe Thompson** has been appointed executive vice-president and general sales manager.

Beaver Precision Products, Inc.—**Roy L. Blanchard** has been elected president and general manager.

Bell Aircraft Corp. — **Leston P. Faneuf** has been elected vice-president and a director.

Oldsmobile Div., General Motors Corp.—**Robert J. Cook** has been named general superintendent for the engine, pressed metal, final assembly, paint and engine parts plants. **Elmer E. Kohl** succeeds him as chief inspector.

Clearing Machine Corp.—**Joseph A. Geuss** has been made chief engineer of the Hamilton, O., plant.

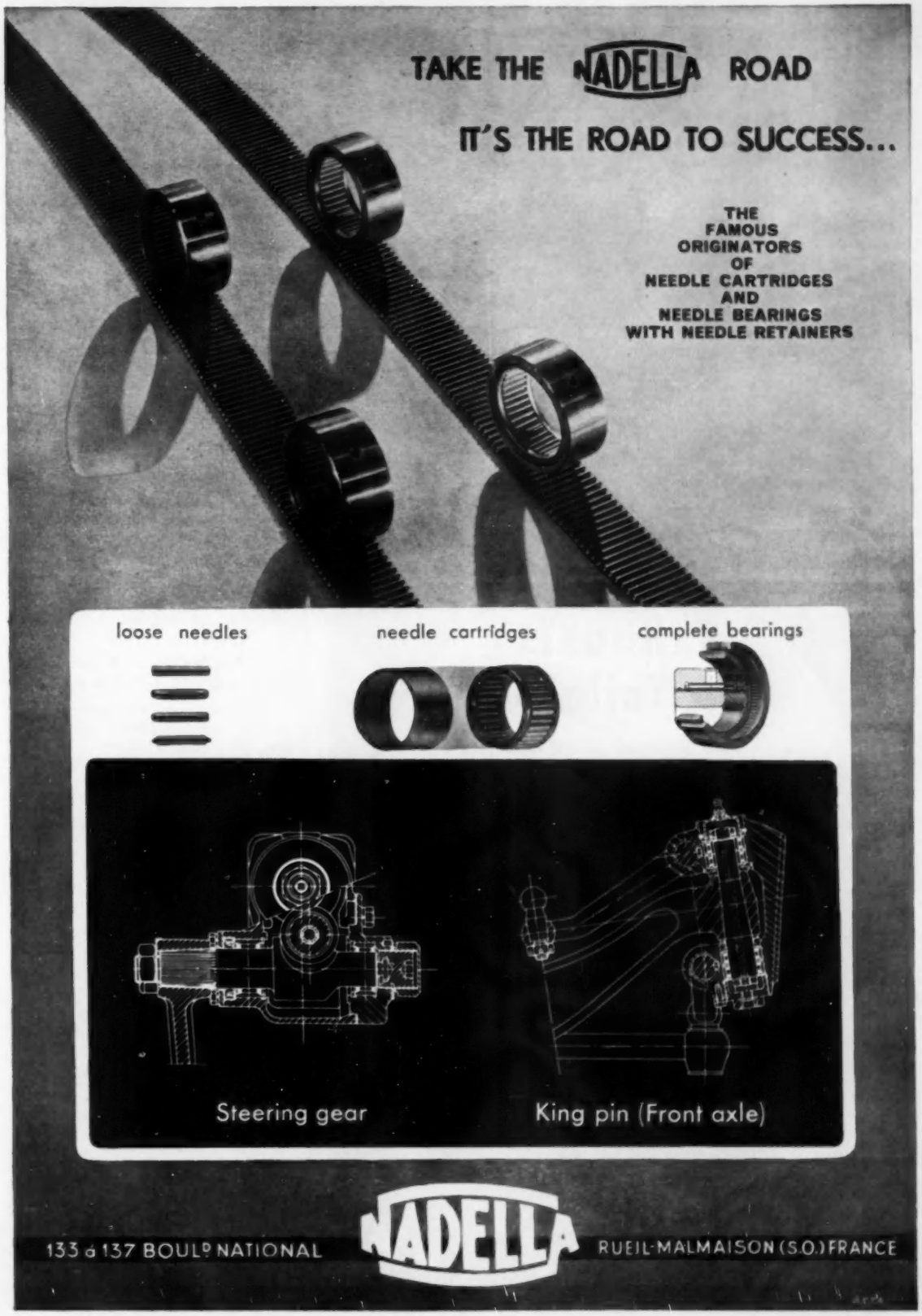
Kenworth Motor Truck Corp.—**Ray L. Medler** was elected treasurer.

Garlock Packing Co.—**J. B. Sewwel** has been elected a vice-president.

Wooster Rubber Co.—**William F. Coulter** is now automotive sales manager.

Schemenauer Mfg. Co.—**George L. Palmer** has become vice-president and controller.

Kennedy Valve Mfg. Co., Inc.—**Walter D. Wood** has been named vice-president in charge of sales.


TAKE THE NADELLA ROAD
IT'S THE ROAD TO SUCCESS...
THE FAMOUS ORIGINATORS OF NEEDLE CARTRIDGES AND NEEDLE BEARINGS WITH NEEDLE RETAINERS
loose needles
needle cartridges
complete bearings
Steering gear
King pin (Front axle)
133 à 137 BOULD NATIONAL
NADELLA
RUEIL-MALMAISON (S.O.) FRANCE

Industry News

(*Continued from page* 112)

Kaiser Shows $1.2 Million Profit for First Quarter

The situation at Kaiser-Willys looks much better now than it did last year. After a hefty $35.4 million loss for 1954, Kaiser Motors came up with a profit of $1.2 million for the first three months of this year.

Willys is shifting heavily to utility and commercial vehicles, and away from passenger cars. It will build no Willys cars during May and June while it turns out 1000 Kaisers for shipment to its Argentine subsidiary.

Willys cars will be built again in July and August, but no Kaisers are scheduled for the American market. There is a possibility that Willys will withdraw from the passenger car business when present tooling is no longer usable.

Willys' sales of commercial vehicles in the first two months of this year were up 79 per cent over the same period last year, and production in the first quarter increased 31 per cent over 1954. Willys noted that its share of the commercial vehicle market in the same gross weight category climbed to nearly seven per cent in February, compared with 4.29 per cent for all of 1954. The February share was the largest Willys has held since June 1949.

Exhausts
and Tailpipes
...our Bread and Butter!
any kind of tube fabricating, our dish!
We cut our eyeteeth on them 27 years ago and they're still mighty important in our business. Since that time we've been performing just about every tube forming operation known to industry. And, if you're in a metal-working industry, chances are you can use to advantage our tube manufacturing and fabricating facilities and experience. Phone or write for helpful service.
FORMED TUBES, Inc.
EOS Prairie, Sturgis, Mich.
Phone 681

Borg-Warner Subsidiary Building New Facility

Borg-Warner Limited, a newly created subsidiary of Borg-Warner Corp., is building a multi-million-dollar plant on a 30-acre site at Letchworth, England. It wil produce automatic transmissions, semi-automatic overdrives, and other component parts for the British automobile industry.

The name of Borg-Warner Limited replaces that of Morse Chain Limited which, as a Borg-Warner subsidiary, has produced chains and sprockets at Letchworth for the British market since 1919. Borg-Warner Limited will continue and will increase the manufacture of all products previously made by Morse Chain Limited.

Amplex Div. Publishes Powder Metallurgy Book

A 52-page treatise on powder metallurgy has been published by Amplex Div. of Chrysler Corp. Entitled *Engineering Manual E-55*, it is liberally illustrated with photos, tables, charts, and graphs.

Separate sections in the manual are devoted to bearings, component parts, and filters. Other subjects include design, loads and speeds, installation, press fit, close-in, shaft clearance, wall thickness, tolerances, temperature change, lubrication, machining, hardening, magnetic properties, and flow rates.

British Concerns Developing Gas Turbine for Marine Use

Parsons and Marine Engineering Turbine Research and Development Association (Pametrada) of England is said to be actively engaged in the development of a gas turbine for marine use. Under present plans, the moving blades and rotors will be cooled by water.

The fixed blades will be made of refractory material. It is reported that much progress has been made in the development of suitable materials and manufacturing methods.

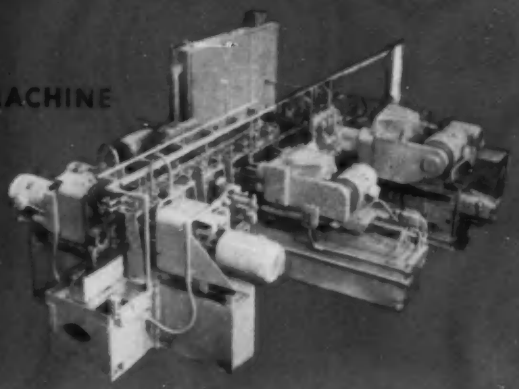
(*Turn to page* 218, *please*)

10 Station Automatic In-Line TRANSFER MACHINE

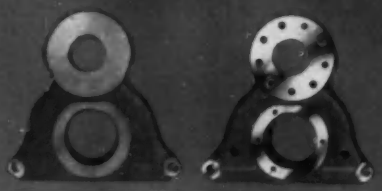
BAKER

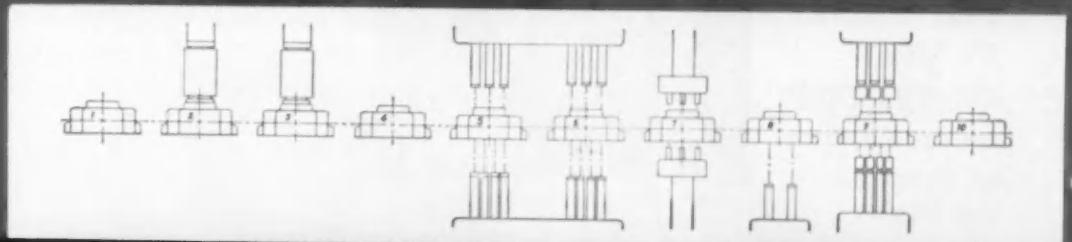
Performs Multiple Operations on Tractor Housings

THE MACHINE



THE PART





THE OPERATIONS

STATION NO. 1
LOAD 1 PART

STATION NO. 2
UNIT NO. 1
COMB. SEMI. FIN. BORE 5.165 & 3.249 & 2.861 DIAS.
COMB. SEMI. FIN. BORE 4.425 THRU BOTH WALLS

STATION NO. 3
UNIT NO. 1
COMB. FIN. BORE 5.180 & 3.264 & 2.876 DIAS.
COMB. FIN. BORE 4.440 THRU BOTH WALLS

STATION NO. 4
IDLE

STATION NO. 5
UNIT NO. 2 "U" DRILL 5 HOLES
31/64 DRILL 6 HOLES

UNIT NO. 3 31/64 DRILL 8 HOLES
21/32 DRILL 1 HOLE
"U" DRILL 6 HOLES
23/32 DRILL 1 HOLE

STATION NO. 6
UNIT NO. 2 ⅛ CHAMFER 5 HOLES
⅛ CHAMFER 6 HOLES

UNIT NO. 3 ⅛ CHAMFER 7 HOLES
13/16 CHAMFER 1 HOLE
½ CHAMFER 6 HOLES
23/32 DRILL 1 HOLE
COMB. COUNTERBORE .796 & CHAMFER 1 HOLE

STATION NO. 7
INSPECTION

STATION NO. 8
UNIT NO. 4
.6910 REAM 1 HOLE
.8157 COUNTERBORE 1 HOLE

STATION NO. 9
UNIT NO. 5 7/16-14 N.C. TAP 5 HOLES
9/16-12 N.C. TAP 6 HOLES

UNIT NO. 6 7/16-14 N.C. TAP 6 HOLES
9/16-12 N.C. TAP 7 HOLES
½-14 N.P.T. TAP 2 HOLES

STATION NO. 10
UNLOAD 1 PART

Whatever Your Specific Job Problem, Consult Baker Engineers. Write

BAKER BROTHERS, INC., TOLEDO, OHIO

DRILLING • TAPPING • KEYSEATING • CONTOUR GRINDING MACHINES

Planet apron conveyor moving through tunnel beneath trim presses.

THIS 1200 FT. PLANET CONVEYOR moves 20 tons of scrap per hour!

At a leading automobile plant . . . this Planet conveyor automatically handles the loose scrap from trim presses with a combined capacity of over 4,000 tons.
Over 20 tons of scrap per hour drop on a Planet hinged-pan apron conveyor as it moves through a tunnel under the presses. Moving to an automatic baler, the scrap is com pressed into 2' cubes. Then the baled scrap moves on a Planet pusher bar conveyor direct to the waiting railroad cars. A simple clutch-operated auxiliary drive assures continuity of operation.

Because baled scrap is worth more . . .
Because the entire operation is automatic . . .
Because this scrap-handling system saves time and labor . . .

• It PAID this manufacturer to "Plan with Planet." It will pay you too! Better write today!

PLANET CORPORATION
1822 SUNSET AVENUE
LANSING, MICHIGAN

• CONVEYORS
• ENGINEERED SYSTEMS
• FOUNDRY EQUIPMENT
• AUTOMATION
• STEEL FABRICATION

Industry News

(Continued from page 216)

Plastic Fuel Tank Process Is Developed by Pastushin

Pastushin Aviation Corp. has announced a new fabrication technique for production of jettisonable fuel tanks and missile and aircraft components from non-critical materials. First product application of the new technique is the company's GFR (glass fiber resin) 200-gal jettisonable fuel tank.

Details of the process for fabricating the tanks are still confidential, it is described generally as an automatic technique for uniformly dispersing chopped glass roving throughout the resin to make a completely homogeneous mass virtually without hand labor. Glass fiber is said to be deposited by a rotary-vacuum procedure in a controlled, random pattern on a single sheet-metal mold.

Danger of displacement of the glass fibers is reportedly eliminated in the process by directing the resin through the thickness of the glass layer. Mold deposit is cured in about 25 minutes by an elastic bag and heat, and the former is evacuated for application of atmospheric pressure.

Position or lay of the glass reinforcement may be varied to achieve directional control of strength. Skins may be locally varied in thickness or tapered over the entire length of the tank, according to Pastushin.

In addition to eliminating fabrication equipment, it is claimed that the process does away with welding. Elasticity reportedly allows joints and components to be bonded without rivets, welds, bolts, screws, or gaskets, while translucent tank material is said to permit sight-checking of fuel.

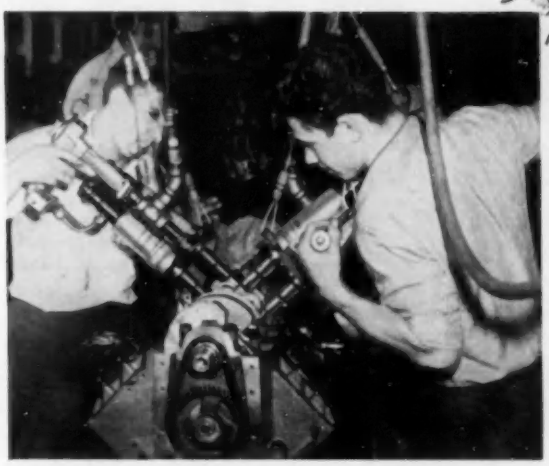
Motor Specialties Sells Its Muskegon Operation

Muskegon Motor Specialties Co., Muskegon, Mich., has sold its plant in that city to Fred L. Flanders, of Spring Lake, who has changed the name of the concern to Muskegon Camshaft Co. Motor Specialties, which has another plant in Jackson, Mich., will continue its present operations there.

The Jackson plant manufactures crankshafts, steering knuckle assemblies, and truck shackle brackets. The Muskegon unit produced camshafts and crankshafts.

(Turn to page 220, please)

Multiple Spindles provide Greater Output!



2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

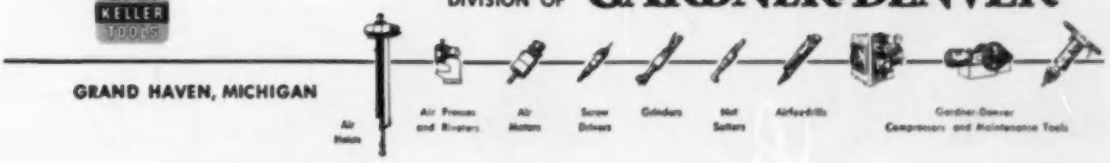
1. Built-in torque regulation in each individual spindle, giving control of torque on each bolt. Torque is adjustable from 4 to 190 ft/lb.
2. Torque held within close tolerances—comparable to that obtainable with accurate hand tools.
3. Increased production and lower production costs.
4. Easily adaptable to changing needs . . . a change in bolt spacing merely requires a new mounting plate for the spindles . . . when a job is completed the spindles are completely salvageable for use in another Multiple.

Do you have applications where bolts or nuts can be run and tightened two or more at a time? If so, it will pay you to investigate this remarkable tool. Write for Bulletin 16-101.

KELLER TOOL

DIVISION OF **GARDNER-DENVER**

GRAND HAVEN, MICHIGAN



Industry News

(*Continued from page 218*)

British Vehicle Production Sets Record in First Quarter

Britain's rapidly expanding motor vehicle industry lays claim to another all-time record production over the first three months of this year. Over 300,000 cars and commercial vehicles had left British factories by the end of March.

Compared with the first quarter of last year, British car production had mounted by over 50,000 to 234,000 units. Commercial vehicles rose by 19,000 to 84,000 units.

The number of export cars actually consigned to world markets up to the end of March totaled over 100,000 units, 20,000 more than in the same period of last year. Commercial vehicle shipments amounted to 41,000 units, an increase of 8500.

Surface bonded lubrication of threaded parts with SURF-KOTE means lower torque, uniform torque of equal tightness — and the banishment of *galling* and *seizing*.

SURF-KOTE forms a hard, continuous lubricating film that holds up in many places where inaccessible parts make conventional lubrication impractical. It permits placing of mechanical and electronic controls for automatic operations without concern for water, steam, chemical actions, dust collection—or extremes of temperature or pressure.

20% Loss eliminated

(Case History "B")

Before SURF-KOTE processing of a nut screwed onto a piece of metal, a manufacturer of motors experienced a 20% loss during manufacture, due to binding. SURF-KOTE processing eliminated the galling, ended rejections. Other manufacturers of motors have had similar experiences.

Parts may be processed in your plant or by us, as you prefer Write for the illustrated SURF-KOTE folder; also Surface Preparation and Application Specification Sheets. We invite confidential discussion of your lubrication problems with no obligation to you.

HOHMAN Plating & Mfg., Inc.

905 East Third Street, Dayton 2, Ohio

B-L-H Conference Studies Metal Powder Press Methods

A new concept in the art of compacting parts from metal powder was the theme of an engineering conference held at the Philadelphia, Pa., plant of Baldwin-Lima-Hamilton Corp., recently. More than 110 metal powder producers and parts fabricators discussed problems relating to the novel compacting technique built into Baldwin's new line of metal powder presses.

The new machines are designed around a visualization of the end product's needs. Instead of having combinations of actions, press components have been individualized so that adjustments can be made to fit any job.

Many of the adjustments can be made with the presses in operation because there are no cams to change. All controls are concentrated on one panel for easy supervision.

Koppers Co. Introduces New Polyethylene Plastic

Koppers Co., Inc., has introduced an improved polyethylene plastic which it claims will open broad new avenues of use to plastic materials. Developed by Koppers from basic European patents, the new material will be marketed under the Koppers trade-name of Super Dylan polyethylene.

The improved plastic material, Koppers scientists predict, will have major utility in the aircraft field, among others, and for applications in industry, where rigidity and toughness are desired.

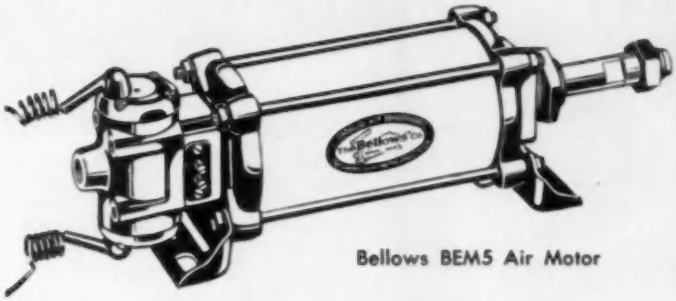
Added properties of the material are also said to indicate its applicability to the making of such items as automobile steering wheels.

Versatility of Jeep Shown In Big Mass Demonstration

Thirty four-wheel drive vehicles fought fires, dug post holes, plowed fields, laid pipe, and performed many other operations during one of the largest mass field demonstrations in motor vehicle history recently near Washington, D. C. The "Jeep-in-action" show was conducted by Willys Motors, Inc., for more than 1500 observers.

Shown for the first time was the Jeep two-wheel drive station wagon with a six-cylinder engine of 226 cu in. displacement. There was also as well a demonstration by the Willys Dispatcher, a two-wheel drive version of the civilian Jeep.

(*Turn to page 222, please*)



Bellows BEM5 Air Motor

WHY YOU SHOULD BUY the AIR CYLINDER with the Built-in Valve

When it comes to down-right value, the Bellows Air Motor (the air cylinder with the built-in valve) tops them all for both standard air cylinder operations or as a component in new design applications. Not only are you buying a precision-built power unit — but you are buying a complete power unit. No extra valves to buy —dual speed control valves as well as directional valve are integral with the cylinder; no cumbersome, complex piping to install—a single, flexible air hose is all the hook-up you'll need.

You can have your choice of built-in directional valves: 110 volt or 8 volt electrical control, standard or explosion-proof, manual control, or air poppet valve control. Five bore sizes: 1¼", 1¾", 2½", 3⅝", and 4½". Any stroke length.

WRITE FOR THESE TWO BULLETINS:

Contain full data and specifications on Bellows Air Motors. Free. Address Dept. AI 555. The Bellows Co. Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd. Toronto.

1104-A

The Bellows Co.

AKRON, OHIO

FELT

by FELTERS

means product improvement

When you want good wear resistance combined with resilience — or a firm material that resists oils and moisture — find out what Felt by Felters can do for you.

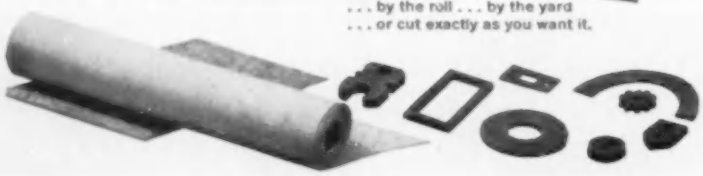
The new 24-page Felters Design Book describes many grades of felt and their uses. For your copy, just drop us a line.

THE FELTERS CO., 253 South St., Boston, Mass.

FELTERS S.A.E. F-13 and F-15 are grades of felt recommended for sound deadening chassis strips, spacers, dust shields and mechanical purposes when abrasion and wear are not important factors.

FELTERS FELT

. . . by the roll . . . by the yard
. . . or cut exactly as you want it.



Industry News

(*Continued from page 220*)

Ford of Canada Sales, Profits Drop in 1954

Despite strikes which shut down its plants for more than two months last year, Ford of Canada increased its share of the Canadian market for cars to more than 34 per cent from 32 per cent in the previous year. Total sales last year, including exports, amounted to $250.325 million, against $309.443 million in 1953, while net profit dropped to $14.243 million from $20.029 million in the preceding year.

The number of cars, trucks and tractors sold by the company in 1954, including domestic and export markets, totaled 135,139 units, compared with 165,802 in 1953. During the first nine months of last year, Ford of Canada sold more American-type cars in the Canadian market than in any similar period in its history. The company's share of the truck market for the entire year dropped to 27.8 per cent from 28.8 in 1953.

CEC Sales, Profits High; Five-Year Program Set Up

Consolidated Engineering Corp. has reported record 1954 sales of $15,644,520 and net earnings, after Federal taxes, of $842,862. Net earnings per share of 94¢ on the 890,459 shares outstanding at year's end compared with earnings of 57¢ per share in 1953.

It was disclosed that the company is undertaking a five-year program designed to point the way to continued progress. Basic elements are an expanding marketing organization; addition of new products through research, development, and outside purchase; and a Systems Div. to provide entire instrumentation "systems" of automatic data-processing and control equipment.

Uranium Rush Boosts Jeep Sales in West

Willys Jeep dealers in the Western states are enjoying a boom in vehicle sales as a result of the rush for uranium in that area. Sales of the company's four-wheel drive vehicles have increased noticeably in Colorado, Arizona, Utah, Texas and other states.

(*Turn to page 224, please*)

How the use of NATIONAL Seamless EXTRUDED Stainless Tubing *cuts nut manufacturing costs*

USING NATIONAL Seamless EXTRUDED USS Stainless (type 303) Tubing, the Tri-Clover Division of Ladish Corporation is now turning out hexagonal nuts in less time and at lower cost than they could using solid bar stock. The savings in material cost alone amounts to 11.77 cents per piece.

All machining on the nuts, except threading and O.D. finishing, is done in one operation on a 6-spindle, 3½ inch Conomatic automatic machine. A saving of five seconds in the time cycle was made by using the extruded hexagonal stock versus bar stock. The use of hex tubing has eliminated the cost and upkeep of boring tools —and, because tubing is considerably lighter than bar stock, it can be handled faster and with less difficulty.

NATIONAL EXTRUDED Tubing offers you high strength, uniformity, and dependability that only *seamless* tubing can give. For a better precision part, involving fewer operations and fewer machine hours, investigate NATIONAL Seamless EXTRUDED Tubing—made by the world's largest manufacturer of tubular steel products. Feel free to call our engineers if you'd like help in applying NATIONAL Seamless to your product.

* * *

National Tube employs a hot-extrusion process known as "Sejournet" in which white-hot billets of steel are squeezed into tubing of various shapes by a 2,500-ton hydraulic press and ram—a manufacturing method that insures absolute uniformity of wall strength.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

NATIONAL Seamless EXTRUDED TUBING

WALLS WITHOUT WELDS

UNITED STATES STEEL

Industry News

(Continued from page 222)

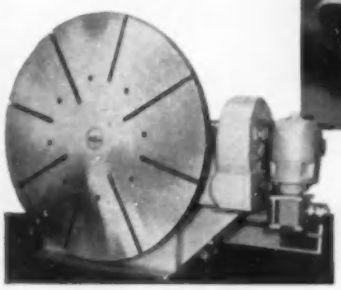
FBI Reports Car Thefts Down Slightly in 1954

Thefts of automobiles declined slightly last year. According to the FBI, there were 215,940 cars stolen in 1954, compared with 226,530 in the preceding year, a decline of nearly five per cent.

It is interesting to note that automobiles accounted for more than half of the total property value lost through thefts last year.

Nevada, one of the states with the lowest number of vehicles registered, had the highest theft rate—508.9 per 100,000 population—while New Hampshire showed the smallest ratio with 41.7 thefts per 100,000 population. In actual number, New York City led the nation with 12,896 reported car thefts, Detroit was second with 7140, and Los Angeles third with 6890.

Industry's First High-Precision Universal Inspection Table



The New ROTAB

ROTAB now gives you fast, accurate checking of complex shapes at a minimum investment in fixtures:

1. **Microscopic Precision**—Direct reading to 5 seconds.
2. **Faster Multiple Inspection**—Simple inspection operations provide closer quality control on radial and angular checking.
3. **Finger-Tip Operation**—Quick acting, positive controls for table tilt and rotation.
4. **Easy Reading**—Checking and measuring planes conveniently positioned.
5. **Four Standard Sizes**—Select the model best suited to your jobs. Face plate diameters available are 12", 24", 36" and 48".

Write for the complete ROTAB *story.*

MACHINE PRODUCTS CORP.
6771 East McNichols Rd. Detroit 12, Mich.
Dept. A

Five Bendix Eastern Divisions Show Latest Aviation Products

More than 300 of the latest developments in aircraft instruments, accessories, and components recently were unveiled by five eastern divisions of Bendix Aviation Corp. at a show held in Los Angeles, Calif., recently.

Manufacturing units of Bendix which sponsored the Los Angeles exhibit included Eclipse-Pioneer Div., Teterboro, N. J.; Red Bank Div., Eatontown, N. J.; Utica Div., Utica, N. Y.; Scintilla Div., Sidney, N. Y.; and Pioneer Central Div., Davenport, Ia.

The display included automatic flight systems, starters, generators, flight and navigation instruments, gyros and a host of new devices engineered to meet the special problems of modern flight. It was seen by more than 1000 executives, engineers, designers, and other key representatives of the Southern California aircraft manufacturing industry.

Correction

In the article describing fabrication and plating operations at the new Oldsmobile bumper plant, page 50 of the February 15 issue of AUTOMOTIVE INDUSTRIES, it was stated that bumper bars are subjected to a temperature of 600 F to stress-relieve the plated coating, rendering ductile the thick copper coating. The statement should have been that this stress-relief treatment renders ductile the nickel coating.

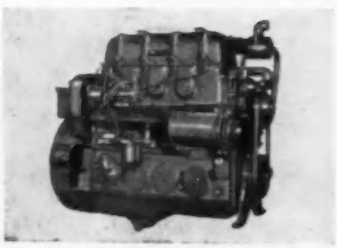
Industry Challenges Cornell On New Car Safety Report

Controversy over safety designs in automobiles in recent years has bobbed up again. In its latest study, Cornell University has come up with a report stating that no progress has been made in designing safety into cars during the last 15 years and intimates that more persons are likely to be killed and injured in new cars than old ones.

The Cornell study claims that cars produced between 1950 and 1954 are more dangerous to drive than those manufactured from 1940 to 1949. Challenging the Cornell study, the automobile industry cites figures showing that traffic deaths last year were five per cent lower than in the preceding year. It also notes that more than 100 new safety features have been incorporated into cars in the last few years.

the P&H diesel

full of fire, but no smoke



Series C-18 P&H automotive Diesels — now with *single*, fully self-contained fuel pump; perfect timing and balance for each cylinder. 90 to 280 horsepower, two-cycle, 2, 3, 4, 6-cylinder models, speeds up to 1800 r.p.m. Also stationary, marine and diesel-generating sets.

The better the combustion, the less the smoke — and the P&H is a *clean* diesel.

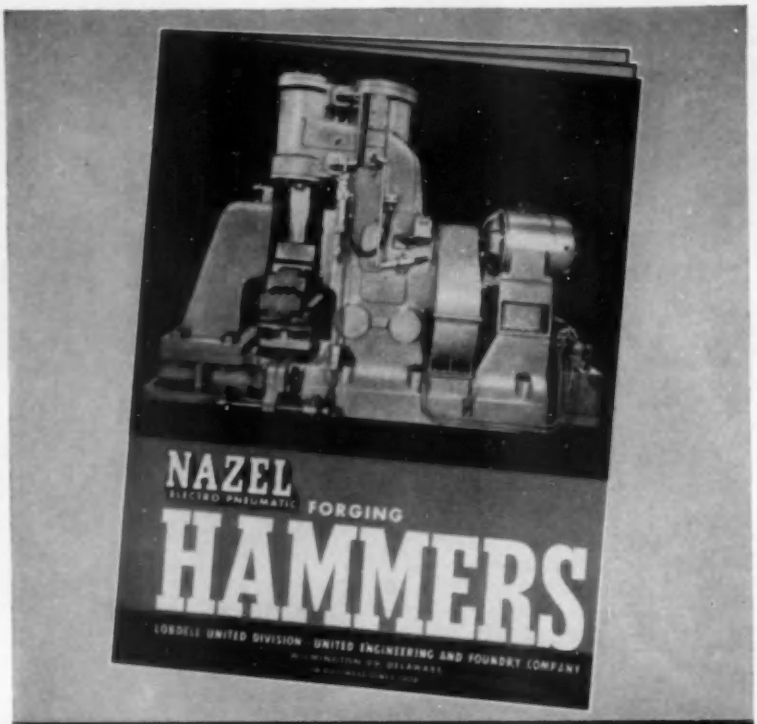
But check its efficiency in other ways. Cost per horsepower . . . it's the lowest of them all. *Weight* per horsepower . . . again the lowest. *Honest* horsepower . . . it's measured at the driveshaft where it all works for you.

Service? A P&H Diesel takes little of that. When it does, *how easy*. You can replace a whole cylinder assembly as a unit — in hours instead of days!

Quite an engine, this P&H Diesel . . . we'll be glad to send you the whole story. Write: P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.

HARNISCHFEGER

the P&H Line



NOW! THIS NEW BULLETIN

TELLS ALL ABOUT NAZEL ELECTRO-PNEUMATIC FORGING HAMMERS

The new, 20 page NAZEL Hammer Catalog gives the reasons why NAZEL is the world's most widely used Electro-Pneumatic Hammer. One of the reasons is because NAZEL Electro-Pneumatic Forging Hammers are *completely self-contained* . . . do *not* require compressors, boiler, piping, nor fuel. Just the "touch of a button" and the NAZEL is ready to operate . . . and a press of the foot-treadle for the lightest to heaviest ram blow.

For every requirement, the various types and models of NAZEL Hammers are on display in this new Hammer Catalog . . . along with specifications and examples of specific installations and applications.

Write, today, for your copy of this new NAZEL Hammer Catalog.

LOBDELL UNITED DIVISION

UNITED ENGINEERING AND FOUNDRY COMPANY

1836 WILMINGTON 99, DELAWARE 1955

Westinghouse Machine Tool Forum

(*Continued from page 75*)

to a gage at the piston grinder, which would in turn control the grinder so that it would produce pistons of the size classification required. As the grinder produces these pistons, the gage at the grinder would then feed size and quantity information back to the computer.

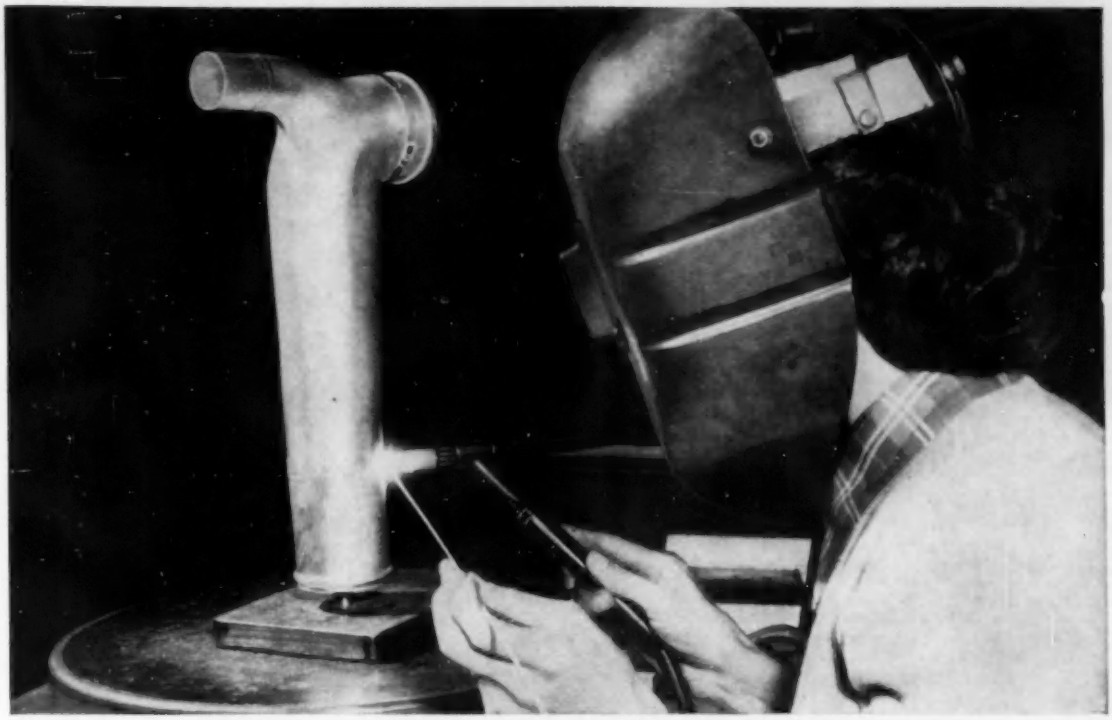
GM Picks 14 Educators As Scholarship Judges

General Motors Corp. has selected 14 outstanding educators to serve as judges in picking winners of the 100 competitive scholarships to be offered each year by GM under its new $2 million-a-year program to support higher education.

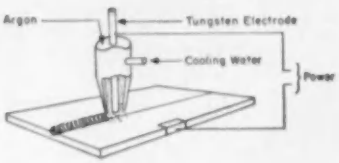
BENEFITS OF PROFITS

It is our hope that this seed will yield a crop called profits. Although some may not wish to refer to such a controversial word, it cannot be denied that the profit motive, call it capitalism, free enterprise, or whatever else you wish, is the foundation for our American high standard of living, and it has made possible the boundless good deeds our country has performed for less fortunate people elsewhere in the world in this Twentieth Century.

—from address of J. E. Cain, president of P. R. Mallory & Co., Inc., before Huntsville Chamber of Commerce referring to the new Huntsville, Ala., plant associated with the Mallory Company.



Sound Welds in 33 Seconds ...by HELIARC Welding



Each of the six appendages of these 52S aluminum aircraft manifolds is HELIARC welded to the tubular main section in from 20 to 45 seconds . . . The spatter-free, flux-free HELIARC welds need no cleaning or finishing—costs are kept at a minimum.

The parts are aligned in a special jig, and tack-welded in position using a lightweight HELIARC HW-9 torch . . . The finished welds are made while the parts revolve on an electrically operated turntable controlled by a foot-switch. Since each weld is completed in less than a minute, production rates are high . . . Here are some of the advantages of HELIARC welding:

- Joins nearly all commercial metals including non-ferrous and high temperature alloys.
- Heat highly concentrated within the area of the weld minimizes distortion.
- Makes all type joints in all positions on metals .020 in. and thicker.
- Portable manual equipment, and semi-automatic and automatic units for all job needs . . . Semi-automatic hand-guided HELIARC welding attains speeds up to 50-in. per minute.

Start saving now—call your local LINDE representative for more information and ask for Form 7942, "Modern Methods of Joining Metals."

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Heliarc" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

Industry News

(*Continued from page 224*)

Caterpillar D7 Tractor Has Many Improvements

Increased horsepower and engine speed highlight many new engineering improvements incorporated in the new D7 track-type tractor recently announced by Caterpillar Tractor Co. Engine in the new tractor has 128 hp at 1200 rpm, compared to the 108 hp at 1000 rpm in the previous model. Maximum drawbar pull for the D7 is now 28,700 lb, approximately 3500 pounds pull more than its predecessor.

Another important innovation is an engine balancer which is said to reduce vibration and permit the four-cylinder engine to operate at 1200 rpm with the same degree of smoothness as a six-cylinder design.

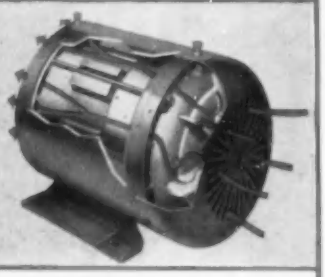
Other new major engineering features include: redesigned engine block; new fuel injection system; a new starting engine; new radiator; larger fuel tank; new fuel filter system; redesigned oil filter base adapter; and improved air cleaner.

to AUTOMOTIVE PLANT ENGINEERS, Howell suggests

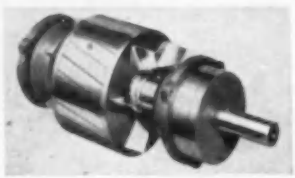
What to look for in the new re-rated motors

The space and weight saving advantages of the new NEMA re-rated frame sizes have been accomplished by various constructions. Prices may be the same . . . but why not insure getting the most for your investment. Below are some points for comparison . . . and a few of the reasons why Howell "Series 100" motors are so outstanding!

VENTILATION... "Cool running" means long life in motors. The steel shell of a Howell Series 100 motor and a stator design with the largest air passages yet devised put ample ventilation where its needed. Compare!



BEARINGS They should be fully protected. Dirt can't enter Howell's cartridge-type, double shielded bearings either from inside or outside the motor. On TEFC motors, cartridge remains sealed when end plates are removed. Compare!



ALL-COPPER ROTORS Howell motors have all-copper rotors. This means better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet special requirements. Compare!

The new Howell Series 100 TEFC Motor

SMALLER • LIGHTER • COOLER • MORE STREAMLINED. TEFC and Open Drip-proof types have the same diameter . . . are completely interchangeable.

WRITE FOR THE SERIES 100 CATALOG

HOWELL MOTORS

Howell Electric Motors Company, Howell, Michigan

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL Red Band motors

BRITISH JET TRAINER

Adopted by 16 air forces is the British de Havilland Vampire jet trainer. Powered by a de Havilland Goblin engine, the plane will be used to teach gunnery bombing, and rocket-firing, as well as flying. It is equipped with twin inter-connected gyro gunsights and side-by-side seating.

New Procurement Program Studied For Contractors

New procurement regulations, which would give some defense contractors more liberal treatment in negotiating cost-plus contracts, has been proposed by the Defense Dept. Under the rules, only manufacturers which do less than 25 per cent of their total business with the Government would be eligible for reimbursement for profit sharing and stock bonus costs in their contracts with the Government.

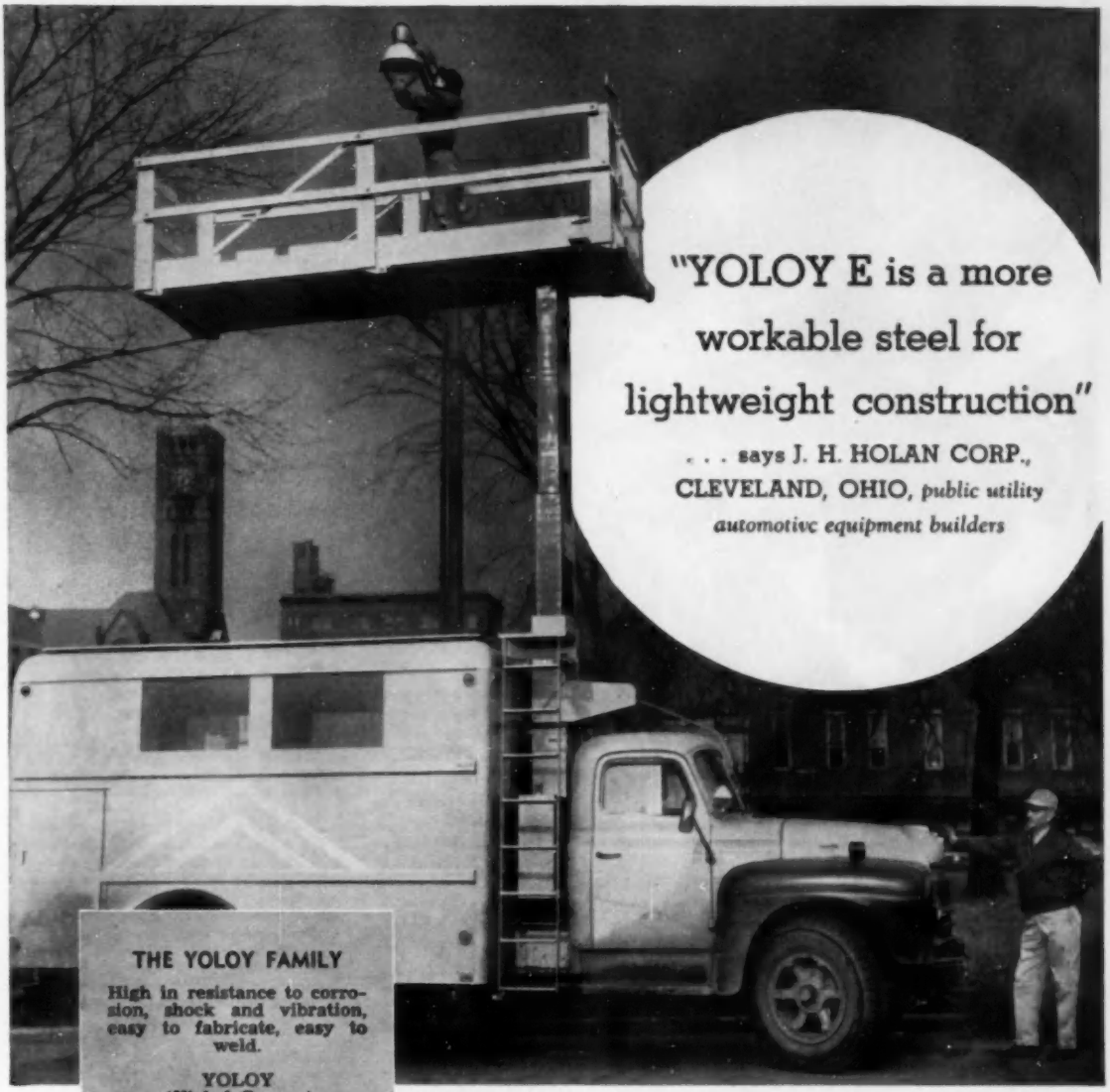
Contractors doing more than 25 per cent of their total business with the Government — which would include mostly aircraft and engine makers — would be eligible to participate in the plan only by "special contract provision."

Car Makers Study Plan To Limit Output In War

Government proposals issued to car and truck manufacturers designed to control production in case of a national emergency are preliminary and subject to change. Both plans, now being studied by the automobile industry, are basically the same as the orders used by the defunct National Production Authority during the Korean War.

Under the first plan issued by NPA in June of 1951, quarterly limits were placed on overall production of vehicles. The second program—the Controlled Materials Plan—was brought

(*Turn to page 230, please*)



"YOLOY E is a more workable steel for lightweight construction"

. . . says J. H. HOLAN CORP., CLEVELAND, OHIO, *public utility automotive equipment builders*

THE YOLOY FAMILY

High in resistance to corrosion, shock and vibration, easy to fabricate, easy to weld.

YOLOY
(Nickel-Copper)
Low Alloy High Strength Steel

YOLOY E
(Nickel-Chrome-Copper)
Low Alloy High Strength Steel

YOLOY C
(Chrome-Copper)
Corrosion Resistant Steel

Holan-built utility truck body fabricated from Yoloy E steel.

QUALITY YOUNGSTOWN SERVICE

● This utility body builder finds Yoloy E—Youngstown's low-alloy high-strength steel—an important time-and-money saver and product improver.

They report that Yoloy E is an easily "workable" steel. Once brake dies are set, there is remarkably little breakage and scrap.

Truck users also benefit. The high strength of Yoloy E permits the use of lighter gauge in bodies and equipment, providing reduced weight and increased payload. The exceptional rust-and-corrosion-resistance lengthens equipment life, reduces maintenance.

For information about Yoloy steels, write our nearest District Sales Office.

Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

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Parts for this piston and sleeve assembly were mated and lapped to a precision fit. Clearance tolerances were maintained on the assembly to less than .00006". Inside diameter, concentricity and grooves were also held to very close tolerances.

ACME CAN PRODUCE PRECISION PARTS OR ASSEMBLIES TO YOUR ORDER

Acme will produce, to your specifications, finished hardened and ground parts from ferrous or other materials, complete from raw stock or from your semi-finished parts, in quantities from one to a million pieces.

Parts can be produced as individual pieces or as assemblies, with or without pistons. Tolerances to within .00001" or less, and corresponding micro-inch finishes can be maintained.

Acme's modern plant contains over 250 metal-working machines and 150 pieces of laboratory testing and inspecting equipment. Services include complete machining, heat treating, grinding, lapping and honing operations.

For over 35 years Acme has been producing hardened and ground parts for thousands of satisfied customers.

Send your prints and specifications to the factory for quotation, or request a representative to call on you.

Write for literature or additional information.

See our file in Sweet's.

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Manufacturers of standard dowel pins • Chamfer micrometer gages • Drill jig bushings • Portable bench centers • Roughness comparison specimens • Hardened and ground parts manufactured to order

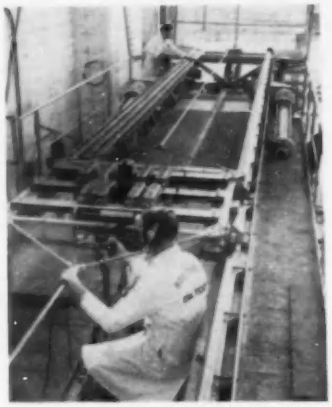
Industry News

(*Continued from page 228*)

out a year later and limited both unit production and materials.

Both of the above plans were dropped in 1953. Under the new proposals, manufacturers could also be required to release some production facilities for building weapons, as they did during the Korean conflict.

AIRCRAFT PARTS TESTER



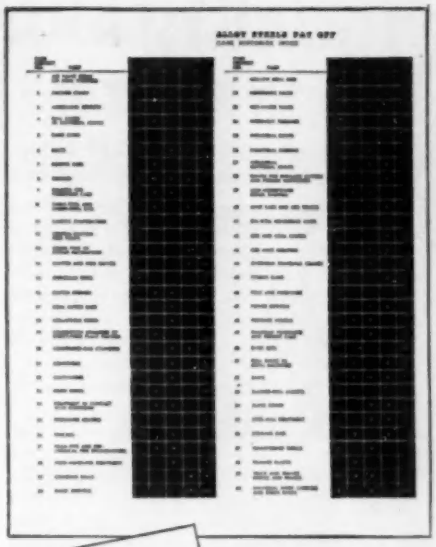
This giant "sling shot" at Northrop Aircraft is capable of providing acceleration loads up to 25 g's for testing of aircraft components. The 250-lb aluminum carriage in the foreground is pulled along the 45-ft track at high speed by a pneumatically-driven steel cable. The carriage rides on wheels located above and beneath the track to prevent it from leaving the rails at high speed. Air to drive the carriage is stored in a pressure tank.

GM's Scholarship Plan Draws 10,000 Students

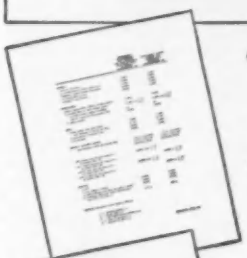
Widely acclaimed by colleges for the far-reaching impact it will have in strengthening independent schools, the General Motors plan to provide 100 college scholarships each year has attracted more than 10,000 applicants from high schools. First scholarship winners, who will receive awards ranging from $200 up to $2000, depending on "demonstrated need," will be notified about May 15.

One phase of GM's new $2 million-a-year program to support higher education, the program provides at least one award in each state, the District of Columbia, Alaska and Hawaii. When the overall program is in full operation, it will be providing benefits to 1400 students.

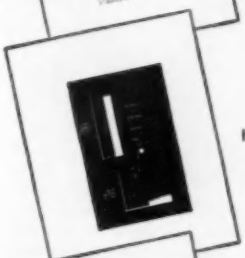
(*Turn to page 232, please*)



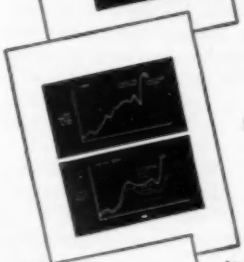
60 fully documented case histories



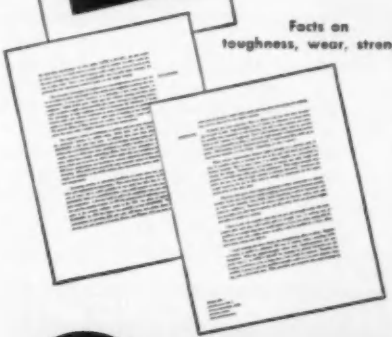
Facts on maximum pay load



Facts on lower operating costs



Facts on lower corrosion rate



Facts on toughness, wear, strength

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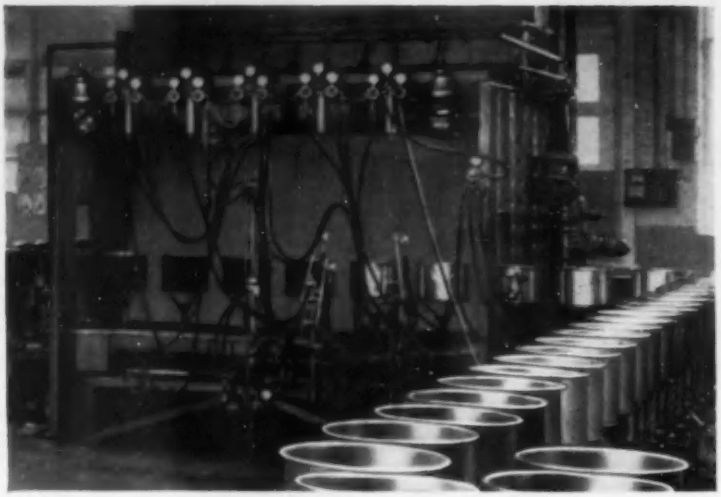
M55-18

***Advantages of ALLOY STEELS**

- longer life
- greater pay load
- lower operating costs
- greater safety
- less maintenance

CLIMAX MOLYBDENUM

WHAT'S WHAT in automatic spray painting



Inside gets clear coating... Outside gets black enamel... ...ALL AUTOMATICALLY!

Automatic spray painting is saving millions of dollars for manufacturers in almost every type of industry. The many benefits of automation in this field were recognized early.

In the installation above, pails whirl their way through the spray booth at speeds that defy manual operation. Automatic spray guns apply a beautiful uniform coating of black enamel on the outside and a clear coating on the inside. If a pail is missing, the guns do not operate.

Machines of this kind not only speed up production to unprecedented levels, but also improve the quality of the finish and effect great economies in materials. Automatics can be designed to finish almost any mass-produced product or part. They are the answer to keeping finishing costs down in the face of rising costs.

Free engineering help. Binks engineers work closely with manufacturers in the design and installation of automatic equipment that meets their special requirements. Binks' experience in this field is available to you without obligation. Just contact your nearest Binks Branch Office or write direct to:

Binks
EVERYTHING FOR SPRAY PAINTING

GUNS

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3120-30 Carroll Ave. West, Chicago 12, Ill.

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Industry News

(*Continued from page* 230)

Survey Shows Only 114 Cities Have Adequate Safety Programs

Despite concerted campaigns during the past several years by a number of safety organizations, most communities throughout the country reportedly still lack effective safety programs. The charge was made in a report on the overall traffic safety situation made for the National Safety Council by the President's Action Committee for Traffic Safety.

The report showed that only 114 of the 811 cities reporting to NSC were adjudged to have effective traffic safety organizations. Of the total, which includes cities of more than 10,000 population, 250 were found to have shown improvement over the previous year in their efforts to curb traffic deaths.

The report also noted that traffic deaths were cut from 38,300 in 1953 to 36,300 in 1954, the first reduction since 1949. President Eisenhower's Safety-Day program, launched last year to encourage more interest in safety programs, played a big part in reducing traffic deaths last year, the report noted. The program will be repeated this year.

Atomic-Powered X-Ray Unit Is Developed by Litton

Aircraft plants may soon have atomic-powered, portable X-ray machines. The Nuclear Electronics Div. of Litton Industries, Beverly Hills, Calif., expects to market soon a 20-lb unit containing its own power. It is safe to use, the company says, and requires no special precautions.

The equipment is planned for use where conventional X-ray units are not feasible. It reportedly would make possible on-the-spot inspection of castings, welds, metal parts, and inaccessible areas.

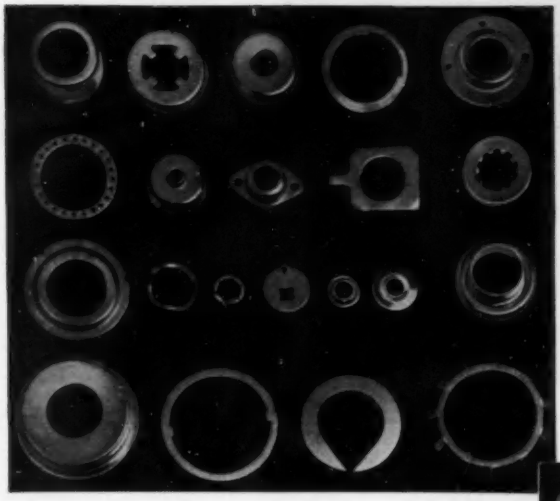
The atomic X-ray unit uses radioactive isotopes of Thulium 170 held in an aluminum capsule and lead-shielded. Pictures are made by opening the lead shield enough to permit gamma ray exposure. The radioactive earth will give six to 12 months of service and can be replaced.

AUTOMOTIVE INDUSTRIES

KEEPS YOU INFORMED

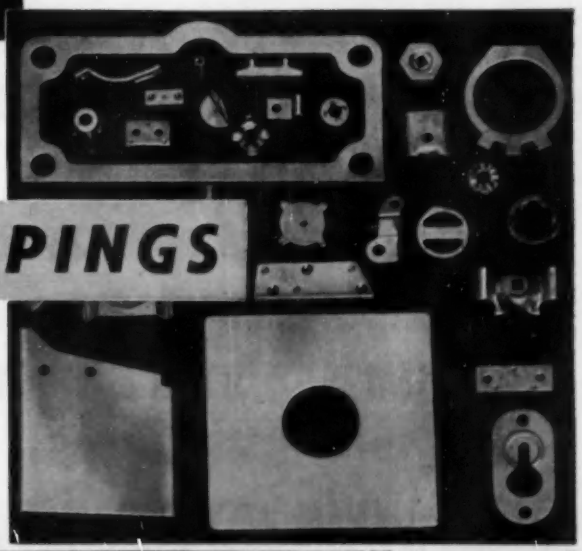
LEADERSHIP *Backed by*
68 Years of Continuous Service to American Industry

MILWAUKEE
WROT WASHERS



SINCE 1887

In terms of "satisfaction to the customer" the dominant leadership of Wrought Washer Mfg. Company in this specialized field represents not only a thoroughly dependable source of supply to meet all your requirements for Standard and Special Washers, but of equal importance, it carries with it a wealth of technical know-how dealing with a wide variety of production and design problems . . . available to you as a gratis service. More than 25,000 sets of dies "in stock" at our plant offer the greatest range of selectivity.



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Our equipment for handling contract production of stampings includes presses for blanking, forming, drawing, shearing and extruding. In many cases it is possible to produce stampings at a lower cost than they can be produced in your own plant, with our own equipment. Our own tool and die-making shop enables us to make up the necessary tools to fit your specifications.

We are equipped to furnish stampings in any desired materials and finishes, ranging in size from small parts to large heavy-gauge pieces. Our engineering staff will be glad to co-operate with you in every way consistent with economical and efficient production.

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Send us your blueprints for quotations on special washers and stampings made to your individual specifications. Write for copy of 76-page Catalog "30" with tool list and complete round washer specifications.

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THE WORLD'S LARGEST PRODUCER OF WASHERS

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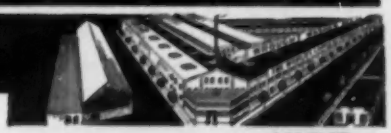

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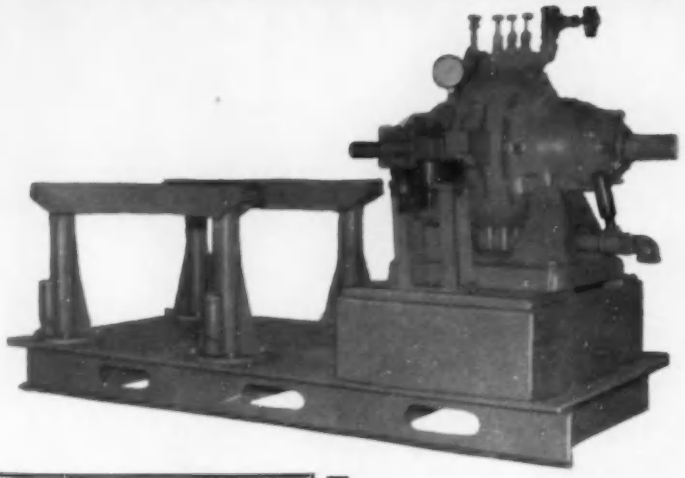
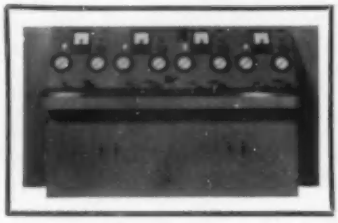
HI-EFF TAYLOR DYNAMOMETERS





For Production and Laboratory Testing

Widely used by manufacturers of

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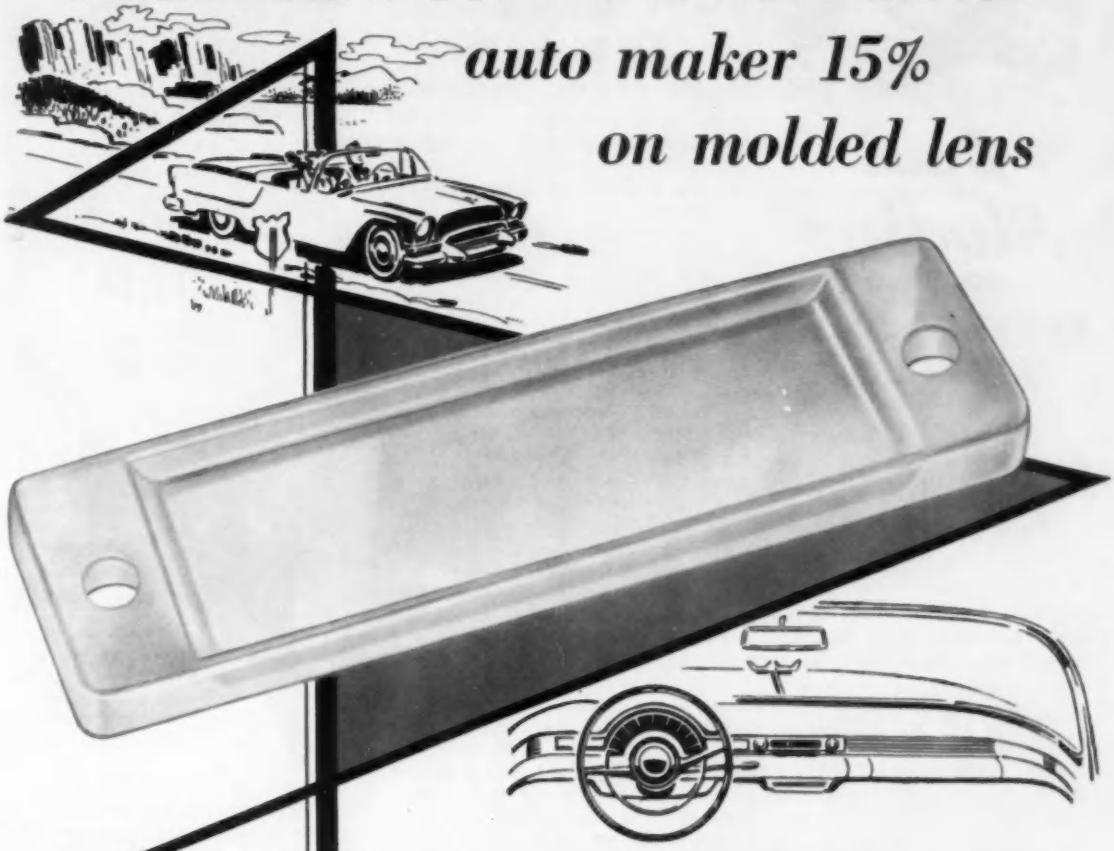
BOOKS...

STORAGE BATTERIES, *by George W. Vinal, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $10.00.* Reflecting the many technological advances in battery design and construction that have taken place during the past 14 years, the new fourth edition of this book has been largely rewritten to bring the reader up to date in this rapidly developing industry. It emphasizes the scientific principles of storage batteries without allowing the treatment to become too highly technical. Physical and chemical properties of the materials employed in making batteries are discussed, and the reader is given a general description of manufacturing processes. The clear, practical presentation of the principles of operating storage batteries covers: charging and discharging, and all their variations; constant current charge; modified constant potential charge; boosting, equalizing, and trickle charge; floating and system-governed charge; gas evolution; and the effects of high and low temperatures. Important industrial applications are described, including telephone service, railway signaling, car lighting, and air conditioning, automotive starting on passenger cars, Diesel starting, trucks and tractors for transporting goods, batteries on shipboard, airplane batteries, and use in mining operations.

TITANIUM IN INDUSTRY, *by Stanley Abkowitz, John J. Burke, and Ralph H. Hiltz, Jr., published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. Price, $5.00.* The titanium industry in the past few years has grown from an investment of a few hundred thousand dollars to a multi-million dollar industry. This comprehensive survey of the status of titanium today has been made to satisfy the demands of industry for authoritative information in the field. From production and properties to the processing of titanium and its alloys, every phase is covered here. The various methods of obtaining the metal from its ores, the physical, chemical, and mechanical properties of titanium and its alloys are included. There are chapters covering alloying and heat treatment, hot and cold shaping, casting and powdered metallurgy, and joining machining and grinding. Surface properties, corrosion, coatings, hardening and cleaning are covered as well as analytical and metallographic techniques.

AUTOMATIC TRANSMISSIONS, *by the Instructional Staff of Commercial Trades Institute, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $5.00.* In keeping with the tremendous growth and popularity of automatic transmissions this new book supplies a wealth of information. The principles, construction, and trouble-shooting data on present-day transmissions for automobiles are presented. The text relates the scientific principles involved in the operation of automatic transmissions and discusses the construction of each popular transmission in detail and in conformity with automobile manufacturers' recommendations. General information is given which might be applied to any of the transmissions described and to many which may be produced in the future. Detailed information is included in instances where specific procedures should be followed. The history of events and the progress of technical development which resulted in our present-day automatic transmissions are reviewed. Sections devoted to the principles of operation of planetary systems, the science of hydraulics, liquids in motion, the theory and operation of the fluid coupling, and the theory and operation of the hydraulic torque converter, are among the topics thoroughly and completely treated.

RICHARDSON *know-how saves auto maker 15% on molded lens*



SIX PLANTS

Molded and Laminated Plastics

A well-known auto manufacturer required a clear acrylic molded lens for a dashboard map light. Richardson received the order, made the mold, and was ready to produce large quantities. At this point, the motor company changed the specifications to call for a translucent instead of a clear lens. To make this change, the customer suggested that Richardson sandblast the mold or sandblast the clear acrylic parts. Either process would have added to the cost of the lens.

Richardson engineers, with a wide background of experience and knowledge covering many different molding methods and materials, suggested instead a special light-diffusing polystyrene suitable for the application.

Lenses made of this material gave the desired lighting effect, and because of lower raw material cost, the customer received the improved lens at a saving of 15%.

Richardson engineers, with wide experience covering hundreds of plastics materials including the latest developments, would welcome the opportunity to discuss your plastics needs with the purpose of making similar savings for your company. Write or phone today. No obligation, of course.

The RICHARDSON COMPANY

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SALES OFFICES IN PRINCIPAL CITIES

Brush
Alodine®
NO. 1200
BONDS PAINT TO ALUMINUM
—
PROTECTS UNPAINTED METAL
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Brush "Alodine" protective finish is easily applied to any aluminum product. It is designed especially for use on aircraft and other assemblies that are too bulky to be treated in tanks. Abraded or machined surfaces of previously Alodized or anodized aluminum can be protected against corrosion, and given a durable paint bond with Brush "Alodine."

Brush "Alodine" No. 1200 is available in bulk, or in the Brush "Alodine" Chemical Kit No. 12 shown above. This handy kit contains enough cleaning chemical and "Alodine" to process about 1000 square feet of aluminum.

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Beryllium Copper Used For Gas Forging Dies

New die techniques which can cut aircraft forging lead time by three-quarters have been developed by North American Aviation's Columbus Division.

The tooling system consists of casting stable forging dies from beryllium copper and other castable alloys. By using cast beryllium copper dies, North American estimates that its lead time can be cut to an average of three to six weeks while reducing tooling costs as much as 75 per cent.

Beryllium copper (and other castable re-meltable alloys) can be used to forge parts of magnesium, steel (both alloy and carbon) as well as aluminum. There is also ample evidence that dies of this castable material will produce sufficient quantities for normal aircraft production runs.

Beryllium copper dies show other favorable features. One is the fact that die finish seems to improve with use because of a self-burnishing that takes place during forging.

Use of beryllium copper as a forge die material has been under investigation for some time at North American's Columbus Division. Extensive research was done before the actual forging experiments began with Wyman-Gordon Co. of Worcester, Mass., running some of the early tests. After a series of runs, successful forgings were produced by Wyman-Gordon from a beryllium copper die inserted in a steel retainer.

At the present time production parts are being turned out with beryllium copper dies, and a program directed toward licensing the development is now under way.

BOOKS . . .

THE CHANGING AMERICAN MARKET, *by the Editors of Fortune magazine, published by Hanover House, 575 Madison Ave., New York 22, N. Y. Price, $4.50.* There is no economic and social phenomenon in the world more portentous than today's American market. There is no economic situation which is bigger, more baffling, more changeable, more in need of general understanding. How and why U. S. consumers spend their money and the immense changes that are being worked in our economic and social life are the subjects of tais book. A special section discusses the automotive industry and predicts what its economic outlook will be over the next five or 10 years.

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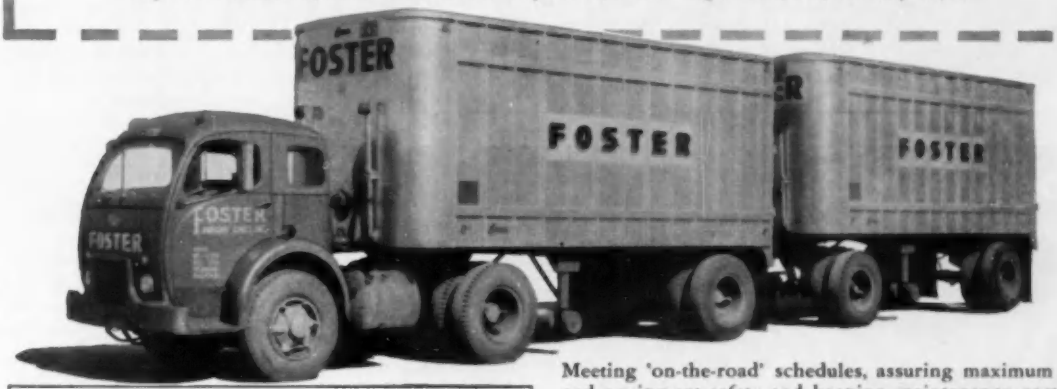
...keep brake maintenance costs low because they are so dependable."

says: R. J. CUMMINS, Maintenance Control Supervisor, Foster Freight Lines, Inc., Indianapolis, Ind.



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Maintenance Control Supervisor

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Mexico Also Has Tax Problems

By Emil Zubryn

MEXICO CITY

IN 1955 the Mexican automobile industry faces one of its most critical periods, according to the Mexican National Association of Automobile Distributors.

The Treasury Department had been seeking to boost imposts by 1000 per cent in certain cases, for imports of assembled cars and trucks and replacement parts. The plan would have hiked customs duties by 120 million pesos ($9,600,000 dollars) but energetic intervention by treasury officials, the Department of National Economy and the President himself cut proposed duties by two-thirds, with these estimated to show an increase of 40 million pesos.

Even so, automobile and truck prices in Mexico are rising and all branches of the industry feel that the levies are unjust since in this modern age an automobile is a prime necessity. Yet, in Mexico, it is being classed as a luxury and taxed in the same manner under the pretext of protecting local assembly plants.

When the peso was devalued in April of 1954, car and truck prices jumped approximately 35 per cent, while parts skyrocketed to 44 per cent above pre-devaluation figures. Toward the close of the year new boosts increased parts by around 10 per cent and cars and trucks about 9 per cent, and with new import taxation, further as yet unestimated, price increases are due.

A spot check of assembly plants, distributors and dealers, shows a marked discontent with the current situation. Whereas prices in the U. S. have shown little variation, in Mexico not only have they risen appreciably but the upward trend continues due to ever-increasing taxation.

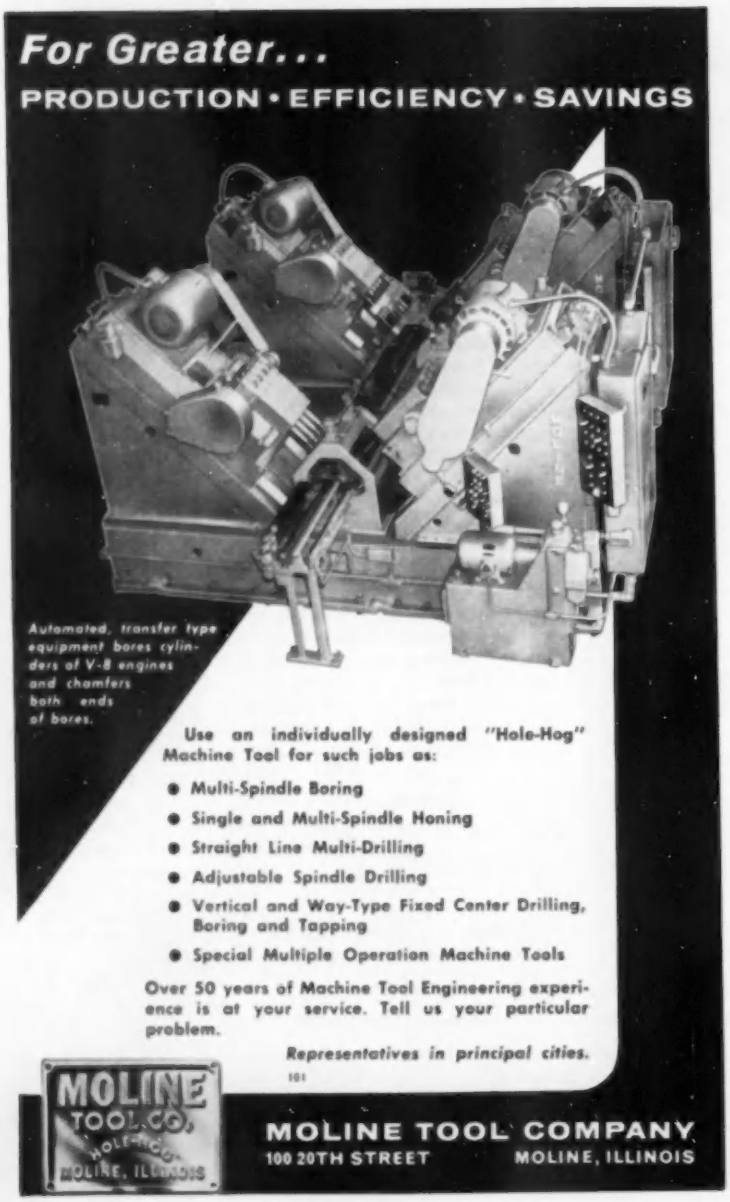
The opinion is that this situation favors inflation and diminishes confidence in the Mexican peso, and will cut into sales heavily. The only remedy, industry leaders say, is an immediate governmental edict reducing taxation so car prices can be reduced and a measure of stability given to the peso.

According to excellent sources, it is learned the government has cut the car and truck quota for 1955 to 27,000 units. Originally assembly plants were to have turned out 30,000 units, but this was cut suddenly by 10 per cent without explanation. It is pointed out that this is but the production of six hours in U. S. assembly plants.

The industry is not very happy about approximately 6000 cars imported, paying duties of only 10 to 45 per cent of those quoted, with the stipulation that the cars must stay in border areas. The probabilities are that the major part of these find their way to the car black market, a thriving business in Mexico.

It is claimed that production in Mexico does not meet national demands, and the limits put on assembly plants serve as a "brake" that holds back development of the industry. An industry spokesman said that Mexico could easily assemble three times the number officially sanctioned, especially by GM, Ford and Chrysler plants which are modern and efficiently operated, yet working at a fraction of capacity.

The assembly plants were established in Mexico to supply cars and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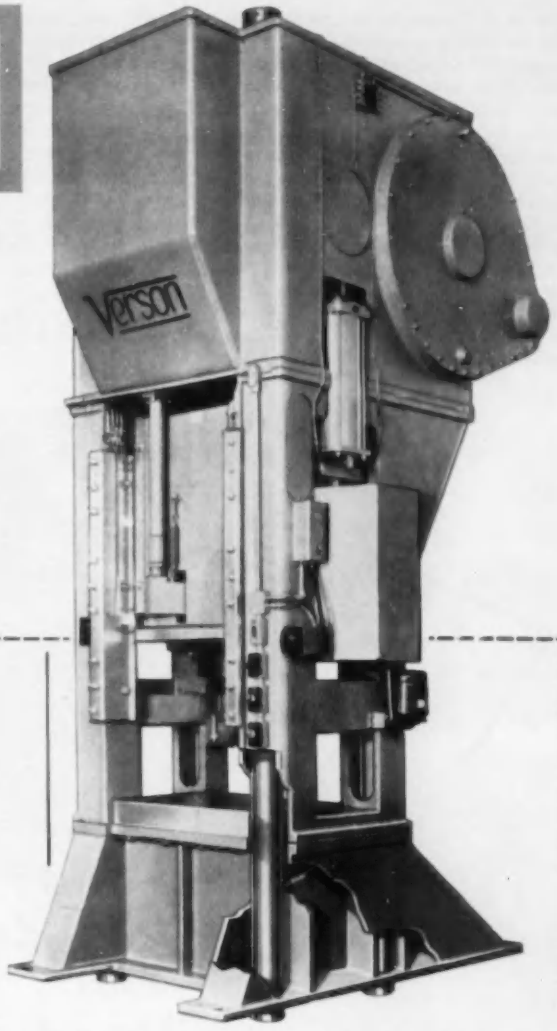

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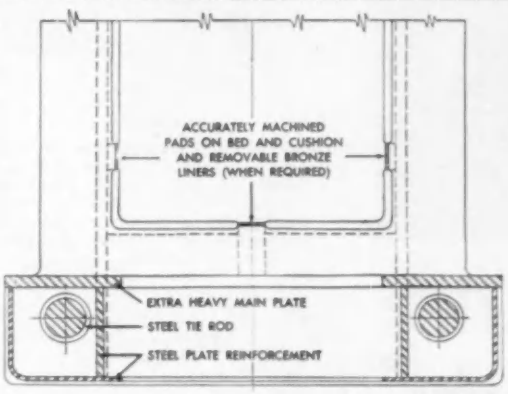
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trucks at cheaper quotations than imported models assembled in the U. S. Under the actual situation now, however, with existing taxes, a Mexican assembled vehicle is either equal in price or, at times, higher than those coming from foreign points. As it is now, a car or truck buyer pays approximately 35 per cent of total value as taxes.

Taxation is a headache which may boomerang to the discomfort of Treasury officials. There is a tax for parts to be used for assembly in Mexico; a per unit tax; a rent tax; an excess profits tax; a dividends tax; direct taxation of assembly plants; mercantile tax, production tax; customs tax and a number of others. And all of these are reflected in the steadily rising retail prices of cars.

New and used car dealers have noted a fall-off in buying, although they will not furnish actual percentages. However, it is known that strong pressure is being put to bear on Mexican Senators to obtain relief from the latest customs hikes which make the industry's situation precarious. Just what success this pressure will achieve is unknown at this writing.

NOW'S THE TIME FOR A *Burr-Master**

Yes, when your production gears need deburring and chamfering your answer is a Burr-Master. Capable of chamfering the entire tooth form and root, Burr-Masters are available in a wide range of models to meet every need.

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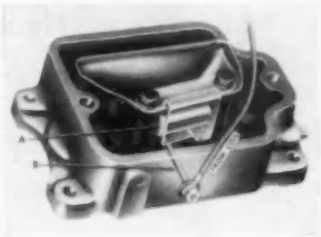
Low Oil Level Ignition Cutoff

PROTECTION against damage resulting from operation with insufficient oil is now available at small added cost on all horizontal shaft models of Continental Motors' heavy-duty industrial air-cooled engine line. It is provided by an automatic low oil level ignition cutoff, which stops the engine when crankcase oil level drops too low for safe operation.

The device has only one moving part, a small closed cylinder of corrosion-proof metal, which is free to float within a metal guide grounded inside the engine base. When the oil level drops too low for proper lubrication,



Part-phantom view of low oil level ignition cutoff. A—Metal float enclosed in metal guide which is grounded to engine base. B—Brass stud, insulated from base and connected to ignition coil by wire lead shown.

one end of this float comes to rest on a brass stud connected to a lead from the ignition coil but insulated from the base. Since the other end of the float is in contact with the grounded metal guide surrounding it, the effect is to short-circuit the ignition and stop the engine.

Replenishment of the oil, of course, raises the float off the stud, eliminating the short and permitting the engine to be restarted.

Consumer Credit Reaches New High of $23 Billion

Automobile financing accounted for more than $11 billion, or nearly half of the record total outstanding instalment credit of almost $23 billion at the end of March, according to a report by the Federal Reserve Board.

Total consumer credit at the same time last year amounted to $21.4 billion. Automobile paper accounted for slightly under $10 billion of that figure.

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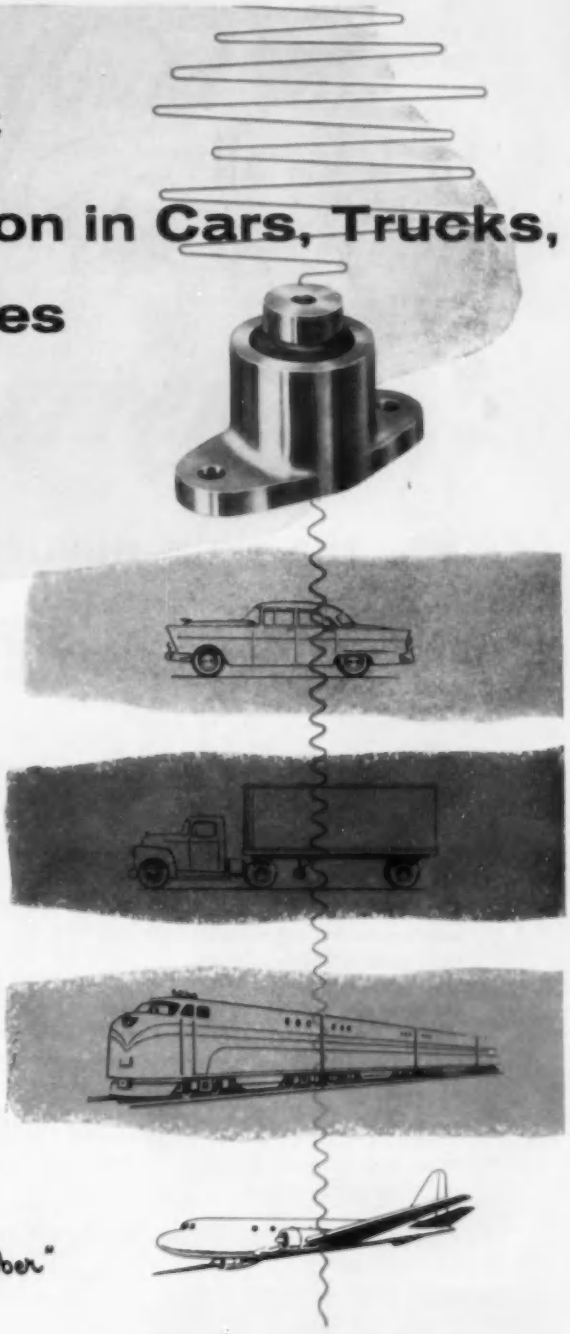
Squelches Vibration in Cars, Trucks, Trains and Planes



Silentbloc mounts and bearings throttle vibration, noise, and shock . . . have been doing it successfully for years in planes, cars, trucks and trains. In fact, wherever there's motion there is probable application for unique rubber-in-metal Silentbloc units.

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"He loses all . . .

who loses
the right moment"

This is a good time to consider whether or not the moment has come for you to make the change in your employment that can mean the beginning of a successful, productive and happy future.

Opportunities are outstanding right now at Fairchild Aircraft Division, for experienced aerodynamists and designers looking for interesting, provocative work in the forefront of aviation design, research and development.

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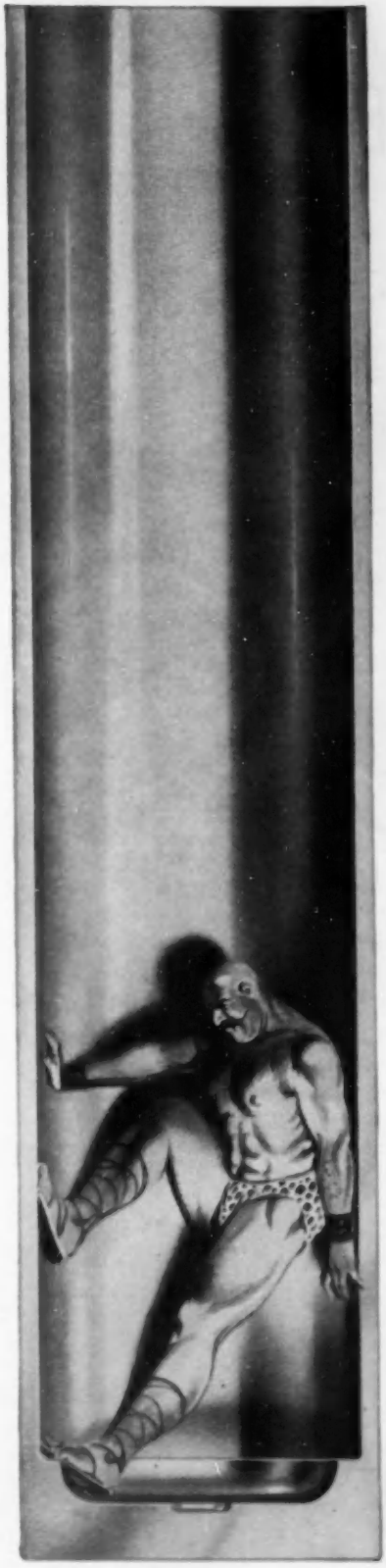
BOOKS . . .

DESIGN OF MACHINE ELEMENTS, *by Victor M. Faires, published by the MacMillan Co., 60 Fifth Ave., New York 11, N. Y. Price, $10.00; college edition, $7.50.* So many machine elements have been stressed and overstressed since the previous edition that this is virtually a new book. New design information has been included for nearly every machine element. New features are, therefore, so numerous that it is impractical to list all of them. Of special interest to many, however, will be the expanded treatment of variable stresses and fatigue. Addition of much material on these topics is fitting, inasmuch as the quantity of design information on these subjects has greatly increased in recent years. Readers will welcome the more detailed coverage of the mechanical properties of materials, Tables two to 10; the replacement of Howarth's charts, obtained from graphical solutions of Reynold's equation, by charts obtained from analytic solutions; the explanation of the fundamentals of rolling bearings; and many other practical improvements.

THE AIRPLANE AT WORK FOR BUSINESS AND INDUSTRY, *published by U. S. Dept. of Commerce, Washington 25, D. C. Price, $1.00.* This study is the seventh in a series prepared by the Civil Aeronautics Administration to determine the amount and kind of flying in the general aviation field which covers all civil flying, except that performed by the scheduled airlines and by the CAA. This study presents the results of a 1954 survey covering flight operations during calendar year 1953. In addition to this detailed analysis, the report contains estimates on general aviation activity during 1954. In an attempt to make this series even more useful, the current edition incorporates many additional basic tables along with certain other new features. For instance, several tabulations have been prepared showing general aviation aircraft classified according to their major usage. This will permit fuller analysis of survey results and will be especially pertinent in market research and safety investigation.

THE REVOLUTION IN WORLD TRADE, *by Samuel Lubell, published by Harper & Bros., 49 East 33rd St., New York 16, N. Y. Price, $2.50.* The author presents here an analysis of America's trade relations with the rest of the world, along with a program looking toward international economic peace. Radical changes in international trade relations following World War II, he suggests, require new measures far beyond America's historic tariff policies and the panacea of Free Trade. Due to the changing patterns of world trade, including the economic imperialism of Russia, the author urges the need for a highly placed American policy body to reconcile security and economic needs and to keep our diplomacy informed of shifts in world trade relations.

ECONOMICS AND THE PUBLIC INTEREST, *edited by Robert A. Solo, published by Rutgers University Press, New Brunswick, N. J. Price, $5.75.* Twenty experts speak clearly and directly in this volume on the practical application of economics to problems of public welfare. Fully aware of controversial points of view and unresolved questions, each presents and substantiates his own position on significant economic problems. Together, they offer an understanding and a clarification of questions which, in the complex society of today, affect the lives of all of us.



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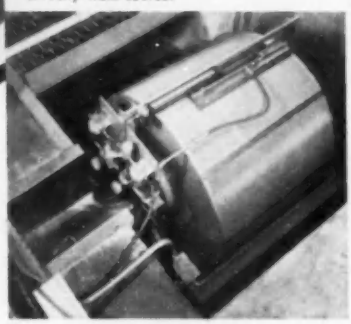
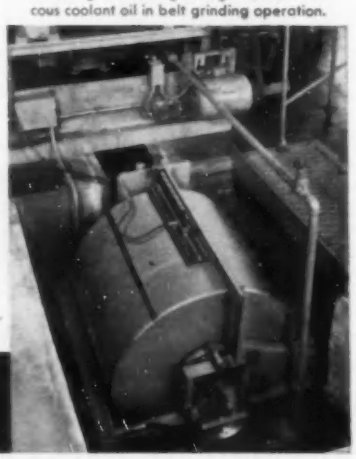


Standard Model 10 with 200 mesh screen removing abrasive grindings from 55 viscous coolant oil in belt grinding operation.



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Webb conveyor systems speed production and reduce costs in the handling of bulk materials, parts and finished products. For, regardless of material to be handled, Webb manufactures conveyors that will exactly meet every need and Webb engineers have the installation experience to secure highest efficiency.

Here's how a paper mill utilized Webb conveyors and engineering to obtain best possible materials handling throughout their entire manufacturing operation. In the woodyard, a daily supply of thirteen hundred cords of pine logs from four states is unloaded from railroad cars and trucks onto three Webb chain conveyors. Two conveyors take logs directly to the chippers while third conveyor can carry the logs either to the chippers or storage stacker shown above.

This stacker, which is the largest in use today, is approximately 300 feet long and rises 80 feet in the air. Up to 30,000 cords can be stored by the stacker. Additional chain, belt, drag, screw and apron conveyors automatically perform such functions as: removing chips from storage bins, carrying chips to digester, and conveying bark to storage or boiler house. Even coal from railroad cars is carried on conveyors to the crusher and then automatically distributed to the boilers.

Within the mill a Webb conveyor system handles rolls 6 feet in diameter and 10 feet long. These rolls, which weigh 10,000 pounds, are carried on roller flight conveyors and slat conveyors from cutting and gluing to banding and weighing. Also, through use of a selector mechanism, finished rolls are sent either to storage or to a slat conveyor located on the shipping dock. 4465

Write to us on your company letterhead and we will be happy to place your name on the Webb mailing list to receive factual technical information on conveyor installations, case history reports, and new product literature.

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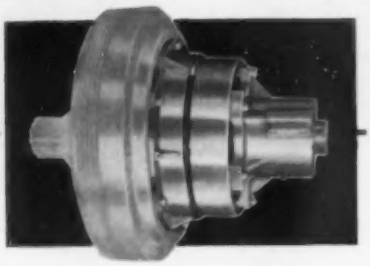

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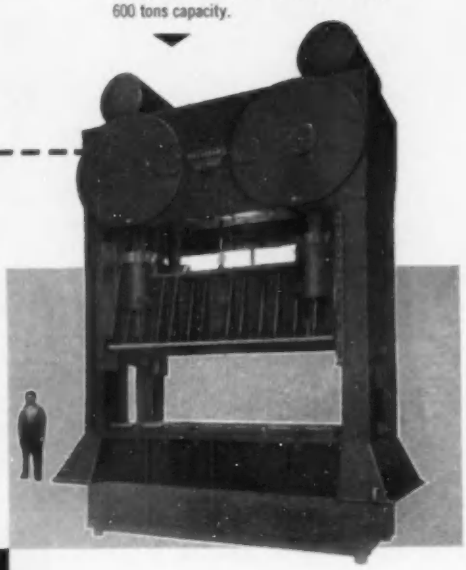
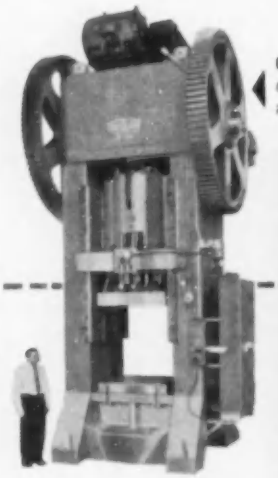
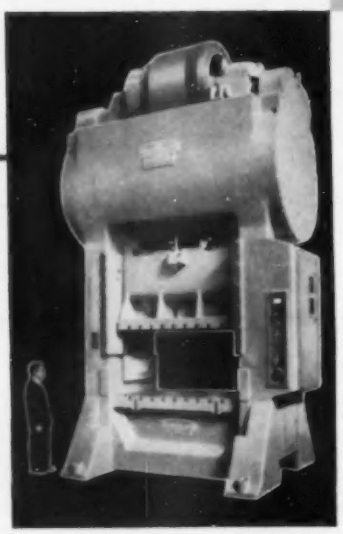
Cleveland S 4-600-204-102 Four Point Press, 40" stroke, 102 x 204" bed area, 600 tons capacity.



Cleveland S 1-800 Single Crank Press double geared, 16" stroke, 48 x 42" bed area, 800 tons capacity.





Cleveland S 2-350-60-42 Double Crank Press, 8" stroke, 42 x 60" bed area, 350 tons capacity.

It doesn't matter which of the 11 types of Cleveland presses best meets your requirements. For as long as it is equipped with our patented Cleveland Clutch, you can be confident that you are getting a press that will give you the best performance obtainable. This proven clutch unit assures minimum down-time, positive, fast control and lower operating costs.

Designed with a minimum number of parts, the patented Cleveland Drum Type Friction Clutch requires only minor adjustments. There is less chance of failure. Its light-weight construction reduces horsepower required for operation. Operational studies prove it to be completely dependable.

Why not investigate the production economy built into every Cleveland Press Equipped with our patented Cleveland Drum Type Clutch. Won't you let us give you the complete Cleveland story? Write or call today!

1880 75 1955
YEARS OF CONSTANT PROGRESS
Diamond Anniversary

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

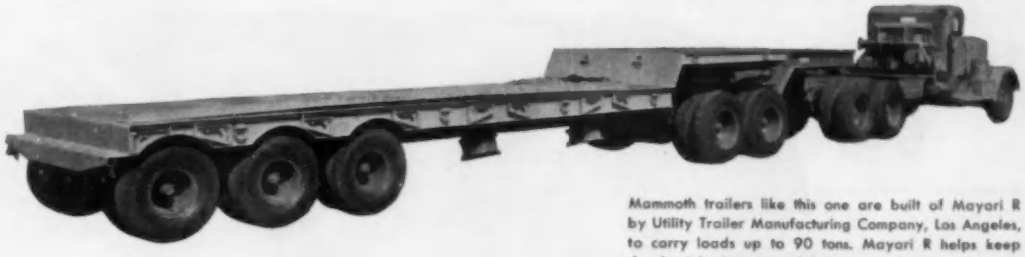
POWER PRESSES
FABRICATING TOOLS

E. 40TH & ST. CLAIR AVENUE • CLEVELAND 14, OHIO

Offices at: NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING • OXFORD, O.

CITY FOUNDRY DIVISION • SMALL TOOL DEPARTMENT

Mayari R makes it lighter... stronger... longer lasting



Mammoth trailers like this one are built of Mayari R by Utility Trailer Manufacturing Company, Los Angeles, to carry loads up to 90 tons. Mayari R helps keep deadweight down to rock bottom, payloads up to peak.

Public utility line construction and maintenance body built by Baker Equipment Engineering Co., Richmond, Va., for the Virginia Electric and Power Co. Used in framing, Mayari R cut out 300 lb deadweight while adding substantially to the durability of the body under hard and continuous service.

They design and build better with Mayari-R

These are but two in an ever-widening variety of trucks and trailers that are being built better and stronger with Mayari R low-alloy, high-strength steel. In both cases Mayari R's superior strength allowed the builders to simplify designs and turn out rugged vehicles with lowered deadweight.

Used in underframes, posts, purlins, body sheets and other parts, Mayari R can save up to 40 pct in deadweight. Or, with units of the same weight, it greatly increases payload capacity.

Either way—weight-reduction or payload increase—dollar savings in operation and maintenance are the result. Ton-mile and passenger-mile costs drop. Truck and trailer freight moves more cheaply. Tire and fuel costs come down, and there is less time out for mechanical repairs.

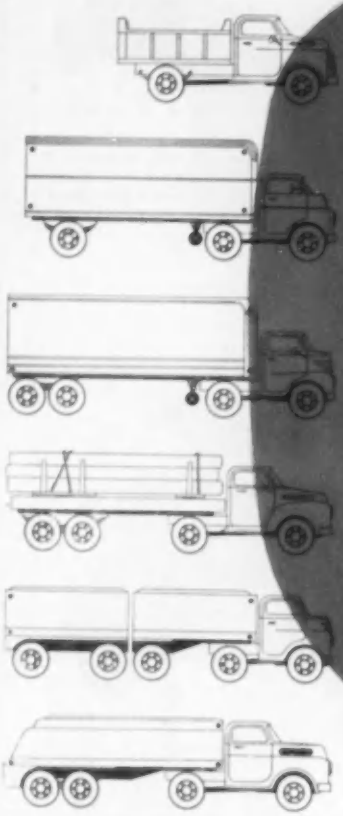
There's a lot more to the Mayari R story, and you'll find it all attractively set down in Catalog 353. A full section devoted to automotive vehicles covers a multitude of ideas, while the charts and technical data will be helpful to your engineers. A call or letter to the nearest sales office will bring your copy promptly.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

GUNITE WHEELS MAKE GOOD TRUCKS BETTER



GUNITE CAST-STEEL WHEELS
Offer Both Price and Weight Advantages to Heavy Truck and Trailer Manufacturers

ESTABLISHED IN 1854

ROCKFORD ILLINOIS

Many engineers are specifying Gunite Cast-Steel Wheel Assemblies on their heavier trucks and trailers. They gain all these advantages:

1. Minimum weight with maximum strength
2. Better appearance
3. Floating rim bolt for easy replacement
4. Increased safety of famous Gunite Brake Drum
5. Greater air-cooling over brake drums
6. Easier Assembly . . . less weight to handle

Write for Complete Engineering Data

GUNITE FOUNDRIES CORPORATION

Lantuck*— the Inside Story of the beautiful '55 Ford

Ford for '55 is a mechanized marvel. But today it takes more than a fine engine to power a sale. It takes styling—outside and inside. Among the diversity of Wellington Sears fabrics that help to put the new Ford on the road, Lantuck stands out as a backing for vinyl upholstery.

Lantuck-backed door panels in the Crown Victoria model—one of several uses in the new Ford line.

For here is a non-woven fabric with a completely random distribution of fibers for true multi-directional strength. These fibers are bonded with a special heat-sensitive resin which fuses completely with vinyl for easy molding and shape retention. Lantuck may be calender coated, laminated or electronically sealed. It measurably improves stretch and tear resistance without interfering with vinyl's soft, pliable hand. In short, if you need a resilient, highly flexible backing fabric that provides smooth surface and high gauge-weight ratio—and at reasonable cost—you need Lantuck. Our nearest sales office has full details for you.

Wellington Sears

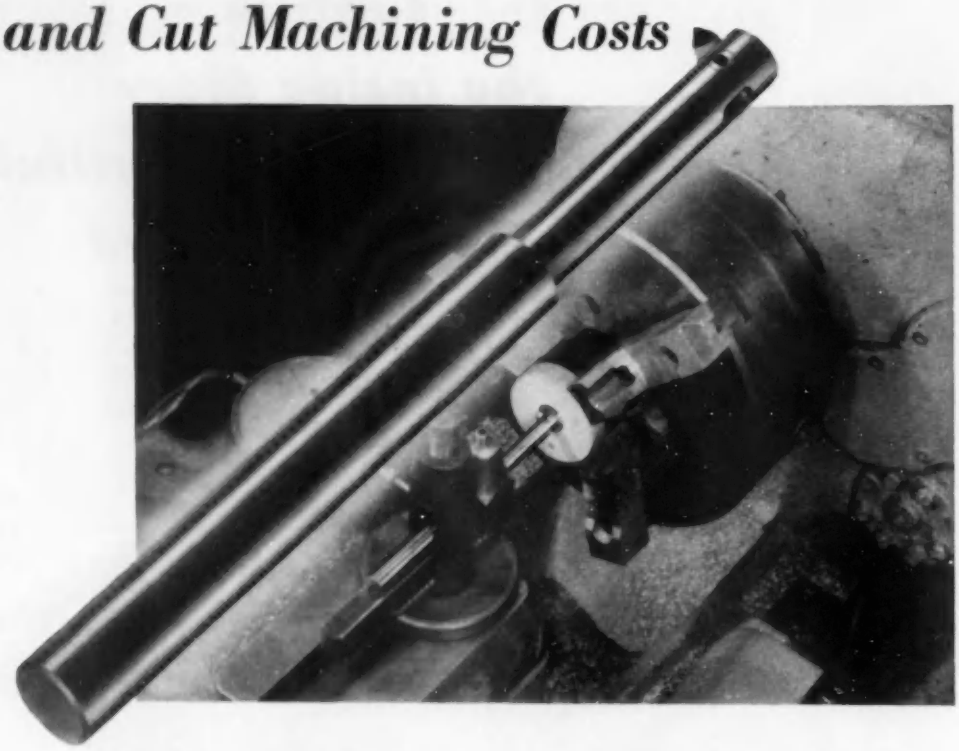
A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

**LANTUCK: Registered trade mark of West Point Mfg. Co. for its non-woven fabrics.*

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

The New Way to Reduce Chatter and Cut Machining Costs



...MALLORY No-Chat* Boring Bars

VIBRATION of cutting tools can be nearly eliminated and overall machining costs substantially reduced when you use Mallory No-Chat boring bars. Made from a unique alloy developed by Mallory metallurgical research, they are more than twice as dense as steel, and have far greater rigidity, tensile strength and thermal conductivity.

No-Chat bars permit you to make deep inside cuts with long tool overhang. You can often turn small diameters that used to require finish grinding.

Longer production runs. Tips last far longer between grinds, because they run cooler and hold their edge longer.

Heavy cuts per pass are possible because vibration is damped out at the source . . . another saving in production time.

No-Chat bars are re-usable. Just replace the tip. Non-annealing *No-Chat* metal eliminates grain growth troubles.

A wide selection of square and round stock is available, in sizes useful for boring bars, tool shanks and for planer or shaper tools. Write to Mallory today for our bulletin that gives complete technical data on this unique way to do better machining at lower cost.

*Trade Mark
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Expect more . . . Get more from MALLORY

In Canada made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

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Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

new clutch is adaptable to all torque needs

* By varying the number of springs in multiples of three, *Lipe* can adapt the five sizes of its new Direct Pressure Clutch to all engines developing from 300 to 1300 ft-lb of torque. For example: depending on its service, a 15" DP can be furnished with its full complement of 27 springs . . . or only 24, 21, 18, or 15.

The advantages of this unique *Lipe* feature are obvious. Manufacturers will find it may be possible to standardize on a single clutch size to meet *all* torque requirements. Fleet Owners will notice the significant reductions in maintenance since clutches won't be under- or overloaded.

Write for full information.

Manufacturers of Automotive Clutches & Machine Tools

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

Quantity
PRODUCTION
of
GREY IRON CASTINGS

*

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

*

ESTABLISHED 1866

THE WHELAND COMPANY

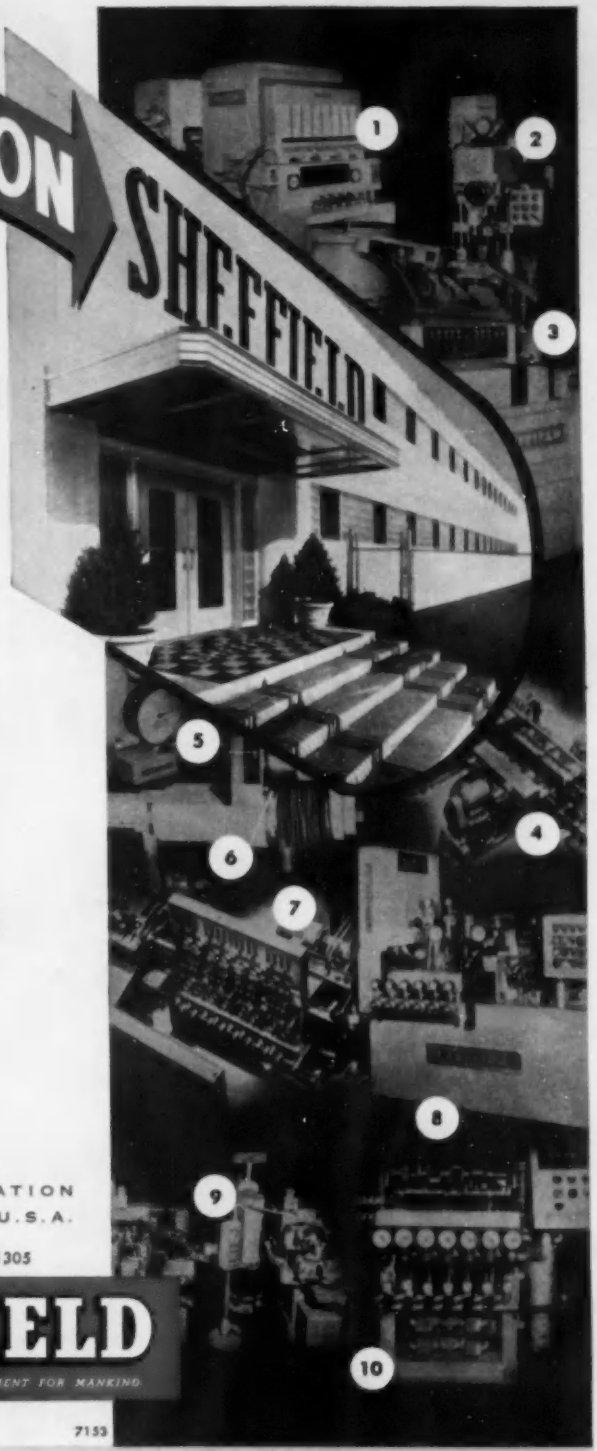
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

AUTOMATION

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
DECADE. IT
WILL PAY YOU
TO CHECK YOUR
NEEDS AGAINST OUR
EXPERIENCE



WRITE DIV. 510 FOR BULLETIN NO. AU-1154

THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.
See us at the
Machine Tool Show, Booth 1305

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MASTER CRAFTSMAN HEADQUARTERS

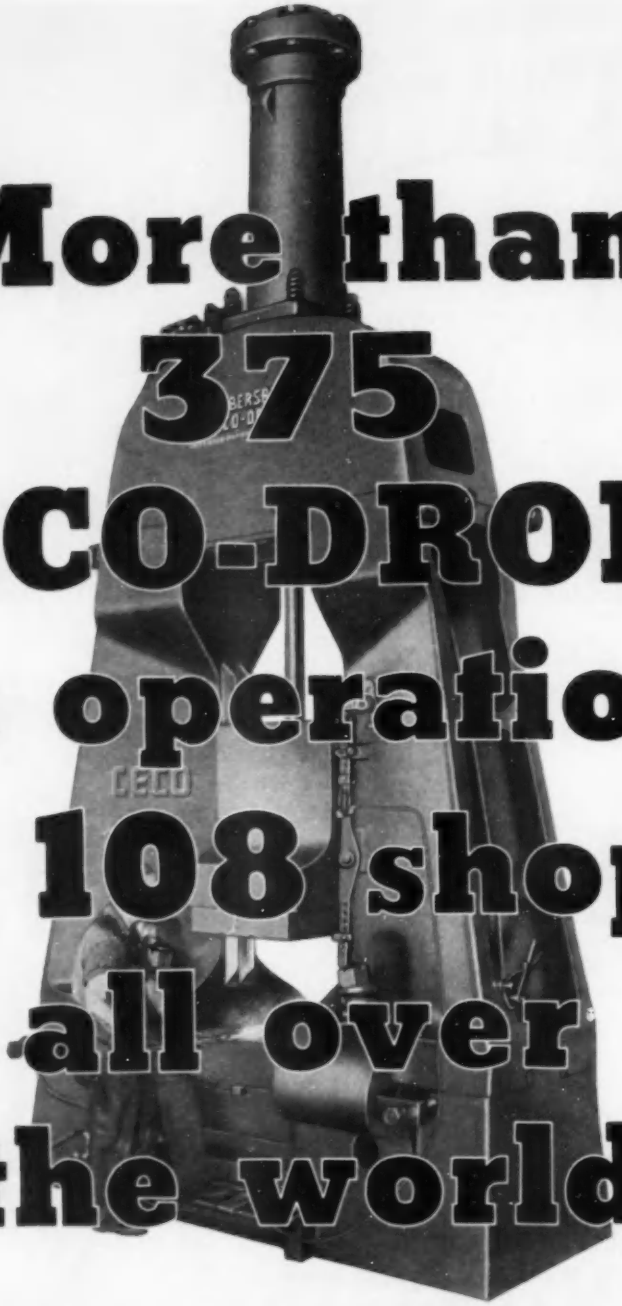
SHEFFIELD

MANUFACTURING AND MEASUREMENT FOR MANKIND

7153

1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

More than 375 CECO-DROPS in operation in 108 shops all over the world



The only gravity drop hammer with short stroke control

CHAMBERSBURG

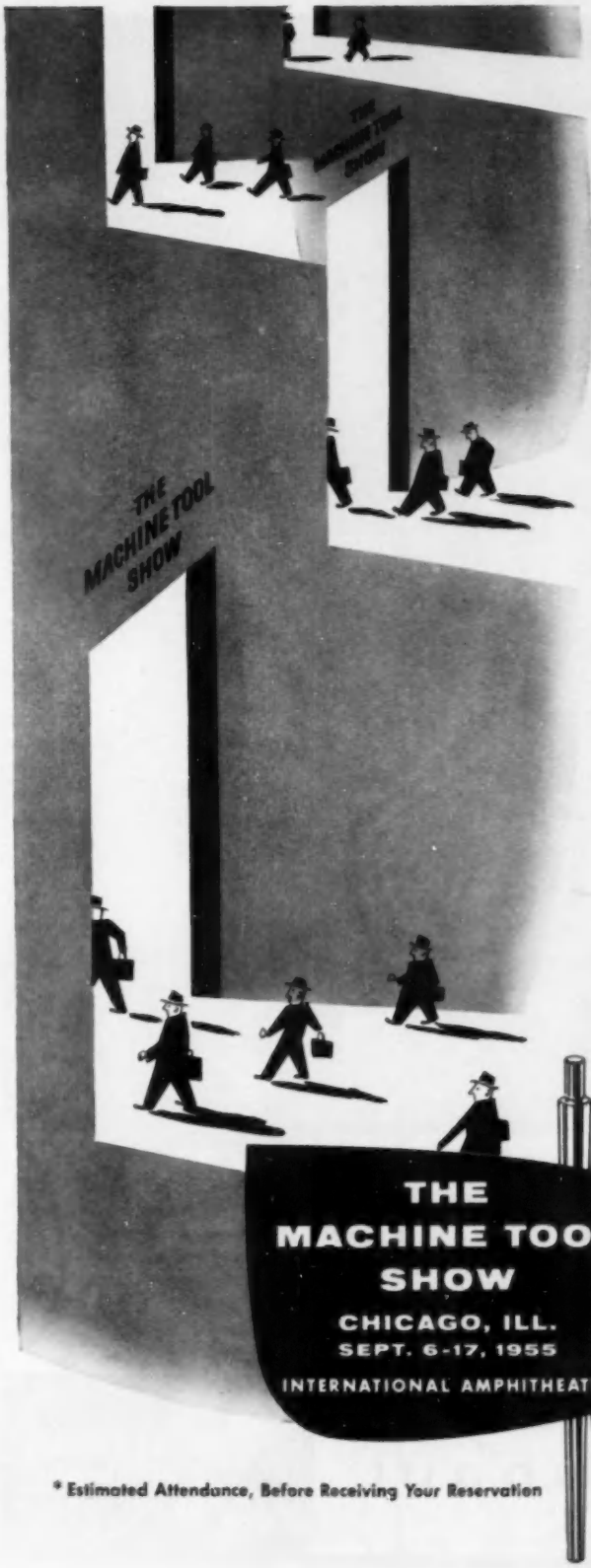
THE HAMMER BUILDERS

CHAMBERSBURG ENGINEERING CO.

Builders of THE IMPACTER

"FORGING IN MID-AIR"

CHAMBERSBURG, PENNSYLVANIA



17,032*

General Managers looking for BETTER METHODS!

Plan *now* to join them—at the Machine Tool Show. You'll find a wealth of answers to each of your metalworking problems. More than ninety per cent of the country's leading machine tool builders will be on hand, ready to show you their newest models, their fastest, most ingenious, most economical production methods.

It's the largest and most important show of its kind; one you can't afford to miss. The last time it was held, in 1947, all attendance records were broken—and this time even greater crowds are expected. The Production Engineering Show, being held on the Navy Pier, in Chicago, on the same dates, offers a bonus attraction that's hard to beat; a chance to see the latest in machine tool accessories at no additional cost. The same badge will admit you to both shows.

Bring your key production people to Chicago in September; share with them this unequaled opportunity to see the latest developments in machine tools. The 1955 Machine Tool Show is the best chance you've ever had to see **the world's best investment**—***in action!***

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
2071 East 102 Street • Cleveland 6, Ohio

*** Estimated Attendance, Before Receiving Your Reservation**

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A Control Factor in Performance!

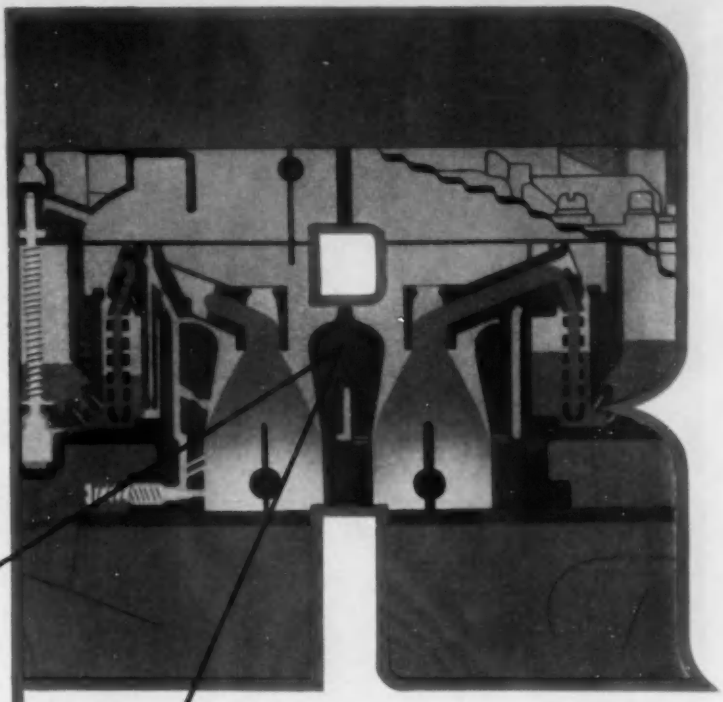
RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

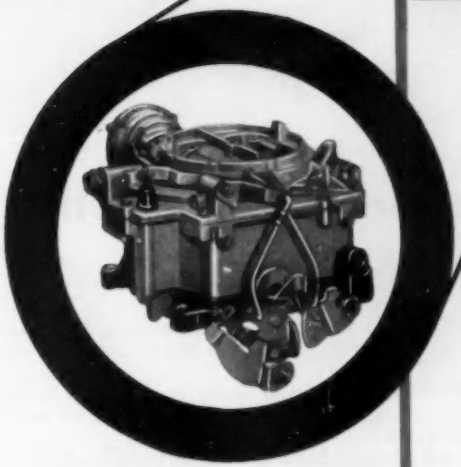
Farm tractors give engine bearings a tough test. It's a matter of heavy-load engine operation through long hours in dusty fields . . . and the bearings *have to "take it!"* For quality and dependability, Federal-Mogul engine bearings and bushings are used by many leading manufacturers of farm tractors. Our engineers have specific answers to such application problems. Your inquiry is invited. Federal-Mogul Corporation, Detroit 13, Mich.

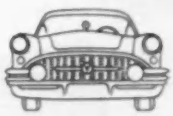
SINCE 1899

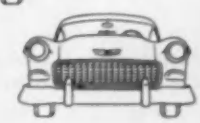
FEDERAL-MOGUL

Engineered for the high compression era!









An engine never had it so good! With a Rochester Carburetor on the job, today's modern high-compression power plants are better "fed" than ever! They're assured of a balanced diet—the right mixture of gas and air to meet every driving situation. From take-off to top speed—regardless of temperature or load condition—Rochester Carburetors are outstanding performers. They're rugged and responsive, dependable and durable . . . and specifically engineered to feed the finest engines in the industry. That's why you'll find Rochester Carburetors fueling the new Cadillac, Buick, Oldsmobile, Pontiac and Chevrolet!

CARBURETORS BY ROCHESTER PRODUCTS

ROCHESTER
PRODUCTS
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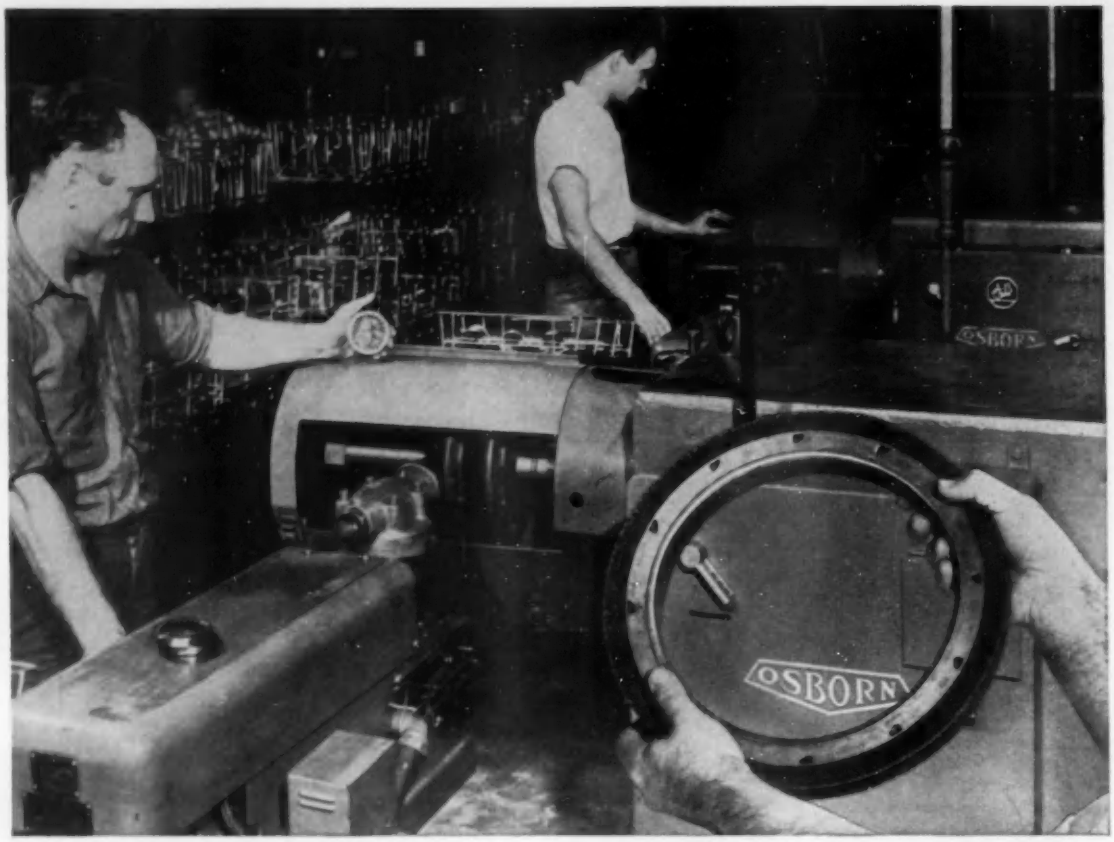
GENERAL MOTORS
CORPORATION
ROCHESTER N.Y.



Remove burrs faster with this push-button method

An OBA will show you how

IMPROVED GEAR QUALITY. *This before-after view of gears shows how Brushamatics remove burrs and blend surface junctures. Result is fewer stress concentrations, longer gear life.*

HERE, you see push-button power brushing removing burrs *and* blending surface junctures on automotive gears faster than any other method.

Operating automatically on preset time cycles, two Osborn Brushamatic* machines maintain strict uniformity of quality at a rate of more than 2000 gears a day.

And, in another plant, a manufacturer reports one Brushamatic saves more than 1000 manhours every year in finishing 17 different types of gears.

Why not have an **O**sborn **B**rushing **A**nalysis discover cost-cutting ways to solve your burr removal problems . . . and cleaning and finishing problems, too? Write for your copy of BRUSHAMATIC IDEAS. *The Osborn Manufacturing Co., Dept. E-29, 5401 Hamilton Ave., Cleveland 14, Ohio.*

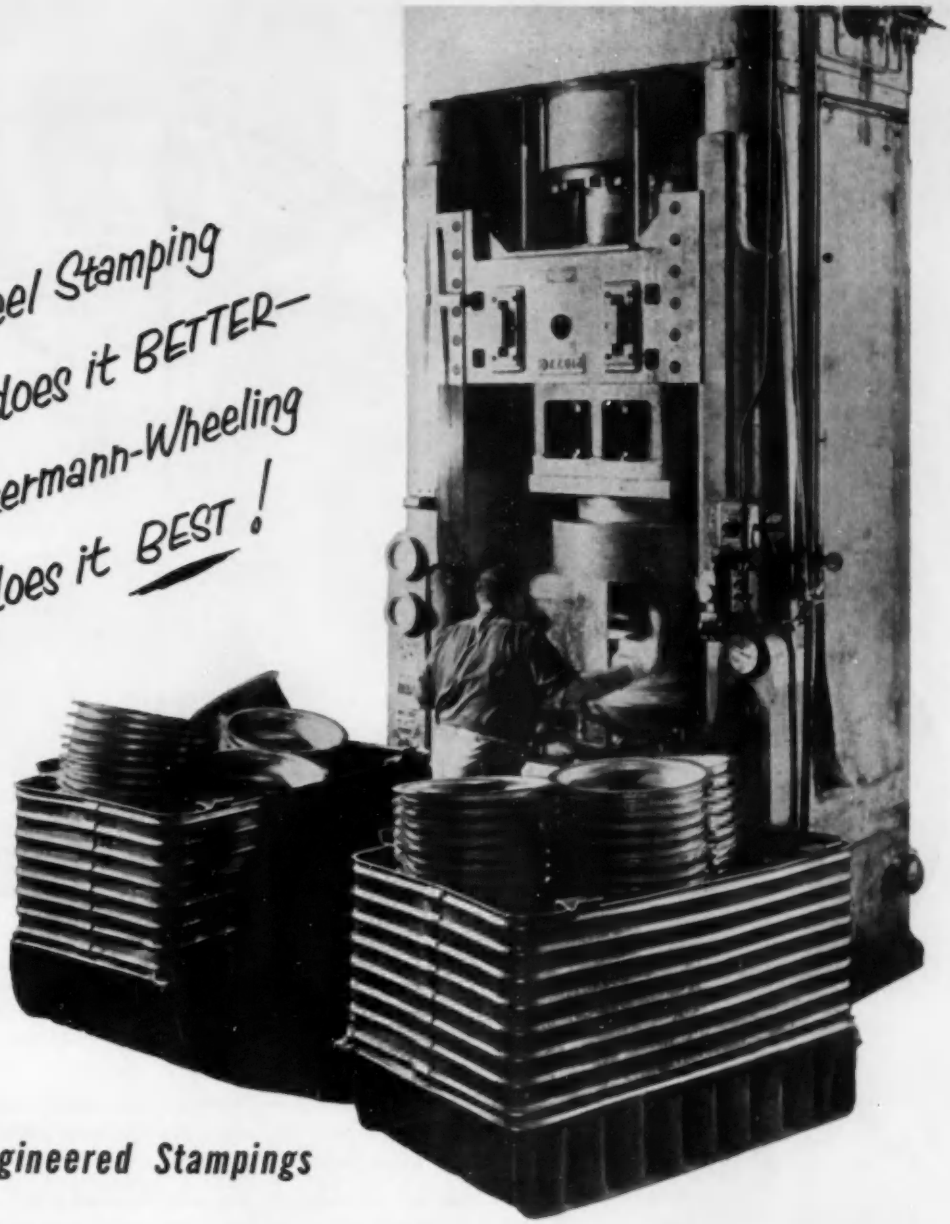
*Trade-Mark

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

Steel Stamping does it BETTER— Ackermann-Wheeling does it BEST!



Engineered Stampings

Hard-pressed manufacturers know that when it is necessary to get production out *fast*... to solve difficult production problems... call Ackermann-Wheeling!

Ackermann-Wheeling means the finest in steel stampings... stampings that give products a definite competitive edge... stampings that often cut costs, allow maximum interchangeability, save machining and drilling operations and improve product appearance.

Here you'll find every production facility: deep drawing, shearing, spot welding, arc welding, brazing, pressing, degreasing, painting. All this plus Ackermann-Wheeling vast background of experience.

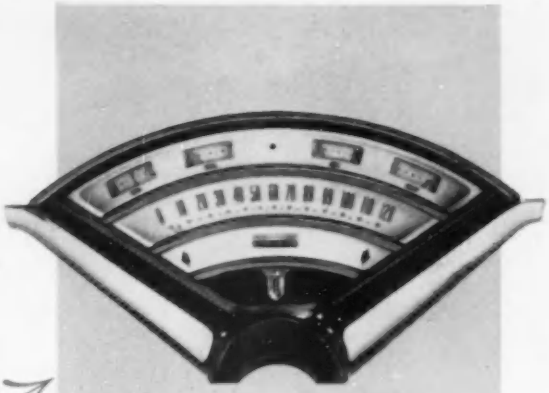
Got a production stamping problem? Let Ackermann-Wheeling solve it, tool it, mass produce it, assemble it! For full details on our services, write, wire or call!

ACKERMANN MANUFACTURING COMPANY

WHEELING · WEST VIRGINIA

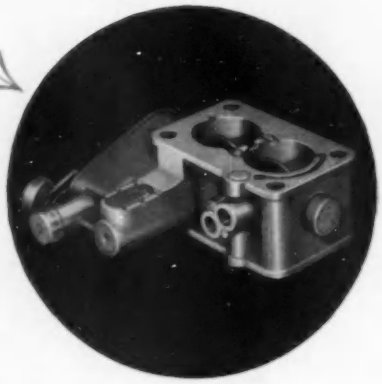
ACKERMANN WHEELING

K-S products are STANDARD in the Automotive Industry



INSTRUMENT CLUSTER

VARI-SPEED GOVERNORS



DIESEL GOVERNOR

King-Seeley automotive dashboard instruments, instrument clusters and governors have been very widely used on passenger cars and trucks for the past 28 years. Among the important reasons are:

- The K-S Research Division works continuously in the development of better designs and more effective processing.
- All K-S products are manufactured under a formal chart system of statistical quality control to assure maximum uniformity and dependability.

When you standardize on these products you provide equipment for your customers consistent in quality with the vehicles you produce.

7173

KING-SEELEY CORPORATION
ANN ARBOR, MICHIGAN

KS

Purolator's "SELECTIVE" FILTRATION leaves additives in

Beneficial additives stay in as HD and heat-resistant lube oils pass through the Micronic* element of a Purolator filter . . . even though the element is straining out sludge, water and impurities as small as one micron (.000039-inch).

It's one of the reasons why original equipment manufacturers in the automotive field use more Purolators than any other make of filter. Besides this "selective" filtration, the accordion-pleated Micronic* element provides ten times the area of older types, making possible:

- ***High flow rates with minimum pressure drop.*** **Purolators themselves can be small . . . yet operate with pumps of standard size.**
- ***Maximum dirt storage capacity . . .*** **for long, efficient service life before replacement.**

*Registered Trade Mark

Micronic elements do not channel. They are waterproof and warp-proof and remain unaffected by engine temperatures. There's a Purolator to fit every vehicle, tractor and other gasoline- or diesel-engine-powered unit in service today. Write for our automotive catalog, No. 2054, to Purolator Products, Inc., Rahway, N. J., Dept. AI-516.

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"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC., Rahway, New Jersey

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EXTREME UNIFORM ACCURACY IN SCREW MACHINE PRODUCTS

SEND FOR This Free 16-page Ball Joint Guide!

This attractively printed 16-page TOUREK Ball Joint Guide-Catalog will be mailed to you without cost or obligation. It contains pictures, diagrams, cross sections, tables, ideas, suggestions and other technical data especially designed to help YOU specify exactly the right Ball Joints for your specific applications. Send for your copy today! ★ If you need "standard" or special Ball Joints, or the fast, economical production of *any* type of screw machine product, you'll profit by turning to TOUREK.

J. J. TOUREK MFG. CO.

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... UP TO 2-5/8" DIAMETER SINGLE AND MULTIPLE SPINDLE MACHINES ...
THREADING • TAPPING • MILLING • DRILLING • GRINDING • POLISHING • PLATING • HEAT TREATING • SILVER SOLDERING

WORLD'S LARGEST MANUFACTURER OF "STANDARD" BALL JOINTS

Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
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- Automatic Release
- All Capacities

in inch grams
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Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

YOURS FOR THE ASKING . . .

the ALL-NEW AUTOMOTIVE INDUSTRIES EDITORIAL INDEX (Vol. 111)

covering the issues from July 1 to December 15, 1954, inclusive

Your copy of the newly revised Editorial Index is now available. This handy Index saves valuable time in searching for specific subjects covered in the past issues of AUTOMOTIVE INDUSTRIES, and is made available to you as an additional service.

Easier to Use

The new Index quickly summarizes all the editorial articles alphabetically by subject along with page numbers and date of issues in which they appear. Articles are listed under several major classifications with considerable cross-indexing for quick reference.

Index for Volume 110 Also Available

There is also available a limited number of the AUTOMOTIVE INDUSTRIES Editorial Index, Volume 110, covering issues from January 1st to June 15th, 1954. If you want a copy, simply indicate on the attached coupon when you request Index for Volume 111. Send for your copies NOW . . . the supply is limited.

Please send me, without charge the new AUTOMOTIVE INDUSTRIES Editorial Index covering the 12 issues from July 1st to December 15th, 1954, inclusive (Volume 111).

I also want a copy of the Index for Vol. 110. (Please check .....)

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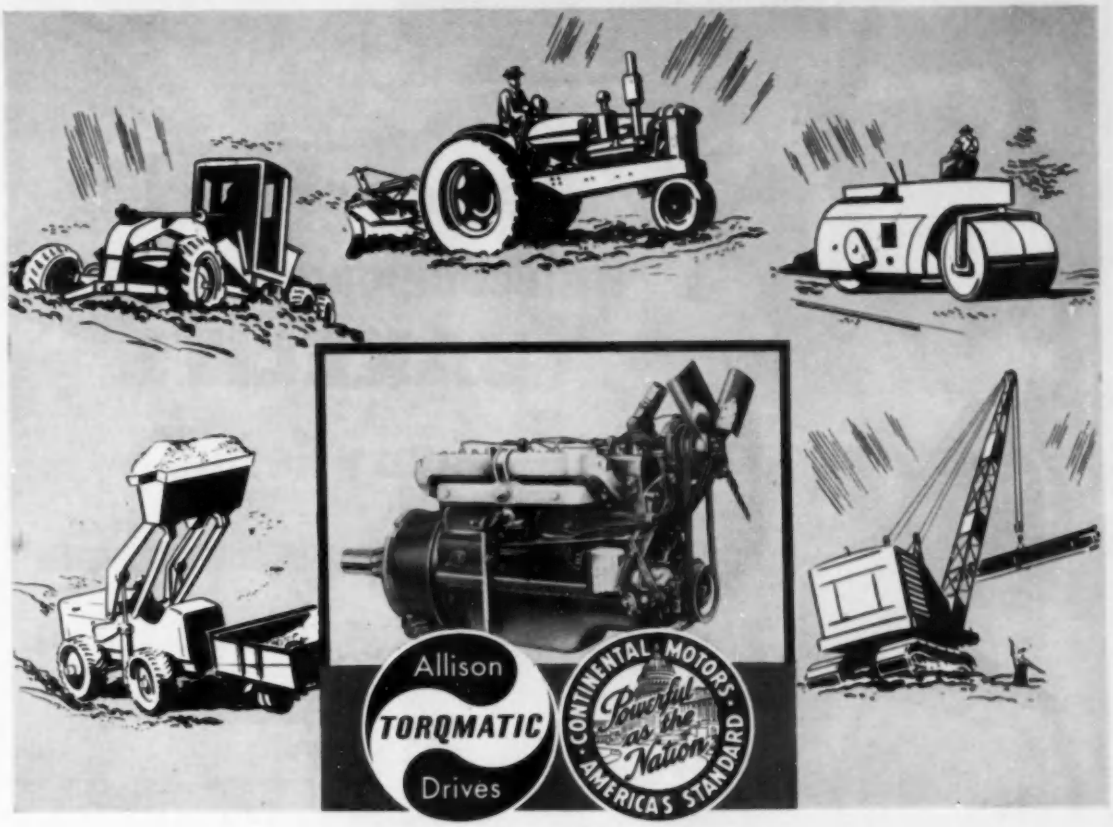

This Team

gets more work from less horsepower

YOU CAN GET an Allison TORQMATIC Converter matched to a Continental RED SEAL gasoline engine in a wide range of hard-working equipment.

When you do you'll get shock-free power that cuts costs all along the driveline – that keeps your equipment on the job building profits, not in the shop raising costs.

The TORQMATIC-RED SEAL team helps manufacturers reduce horsepower with no loss in equipment work-ratings. That's because the TORQMATIC Converter can *triple* engine torque – helps a lower-horsepower engine deliver higher *working* power.

And it automatically balances engine output with load demand to boost working speed and engine efficiency – increases engine life and cuts maintenance costs by keeping the engine in its most efficient operating range at all times.

Allison's newest TORQMATIC Converter is easy to install and maintain. It is completely self-contained, requires no complicated piping or other connections. It has a built-in pump and oil cooler, carries its own oil supply, has a simple dip-stick to check oil level.

You can get an Allison TORQMATIC Converter matched to gasoline or Diesel engines from 40 to 400 horsepower – a TORQMATIC Transmission for engines up to 300 horsepower. Ask your equipment dealer or manufacturer about Allison TORQMATIC DRIVES next time you buy – or write Allison Division of General Motors, Box 894A, Indianapolis 6, Indiana, for more details.

GM TORQMATIC

Allison
TORQMATIC DRIVES

Fast, low-cost tooling with compounds based on BAKELITE TRADE-MARK Epoxy Resins

Frequent model changes and tough competition demand quick tooling at less cost. Look into these advantages of BAKELITE Brand Epoxy Resins for metalworking tools:

- **Liquid compounds—can be cast to shape without pressure**
- **Cured at room temperature—no applied heat**
- **Minimum shrinkage—minimum finishing**
- **Excellent flexural, compression, and impact strengths**
- **Outstanding dimensional stability**
- **Light weight means easy handling**
- **Laminated with glass cloth to form jigs, spotting racks, fixtures, and Keller models.**

Ren-ite® Plastic tooling compounds cut costs on this job by four fifths! Delivery time was cut 70 per cent! Drop hammer dies for this press are made of compounds based on BAKELITE Epoxy Resins and produced by **Ren-ite Plastics,** Lansing 4, Mich. The dies stamp these trays out of 75 SO aluminum sheet.

BAKELITE BRAND EPOXY RESINS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

How Alcoa helped Sealed Power develop a better transmission seal ring

As aluminum came into use in automatic transmissions, it became apparent that there was a need for transmission seal rings with a different coefficient of expansion than that exhibited by cast iron.

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Altogether something over two years was spent in a co-operative effort to select the proper alloy, the best Alumilite* finish and the most economical method of production. Alcoa's Development Division in Cleveland built temporary equipment to produce castings in sand, in plaster, in semipermanent mold and full permanent mold, and investigated the possibility of centrifugally casting ring sleeves.

*Trade Name of Aluminum Company of America

Sealed Power aluminum transmission seal rings are now in use in one automatic transmission, have been approved as a 1956 production item in another and are on test in other transmissions.

* * *

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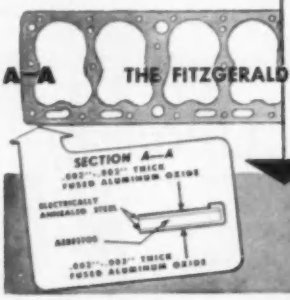

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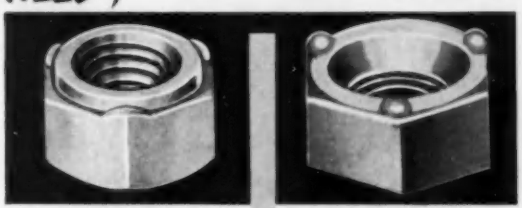

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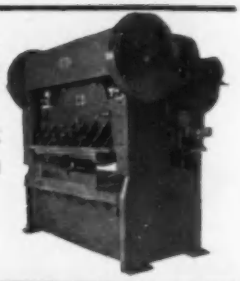

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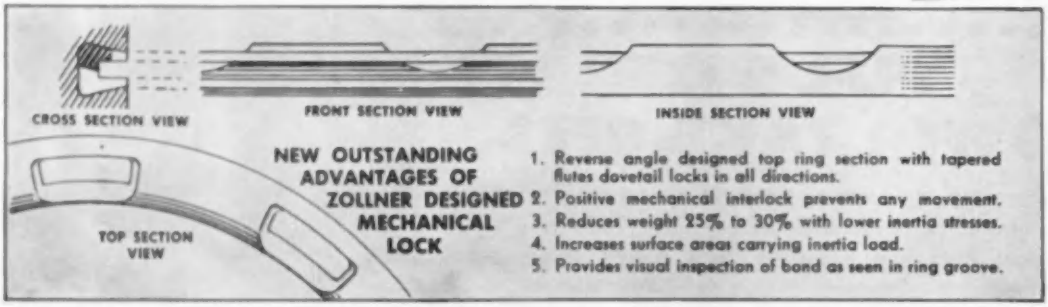

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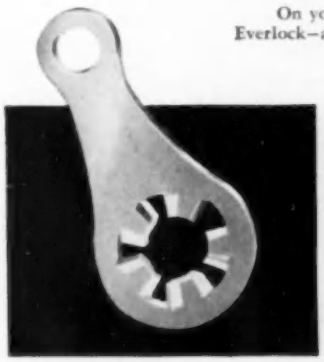

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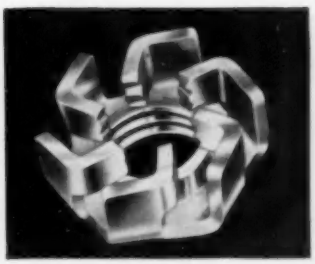

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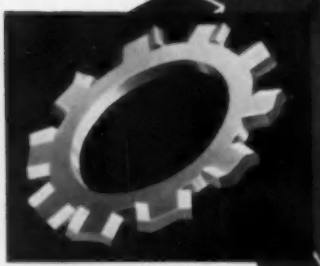

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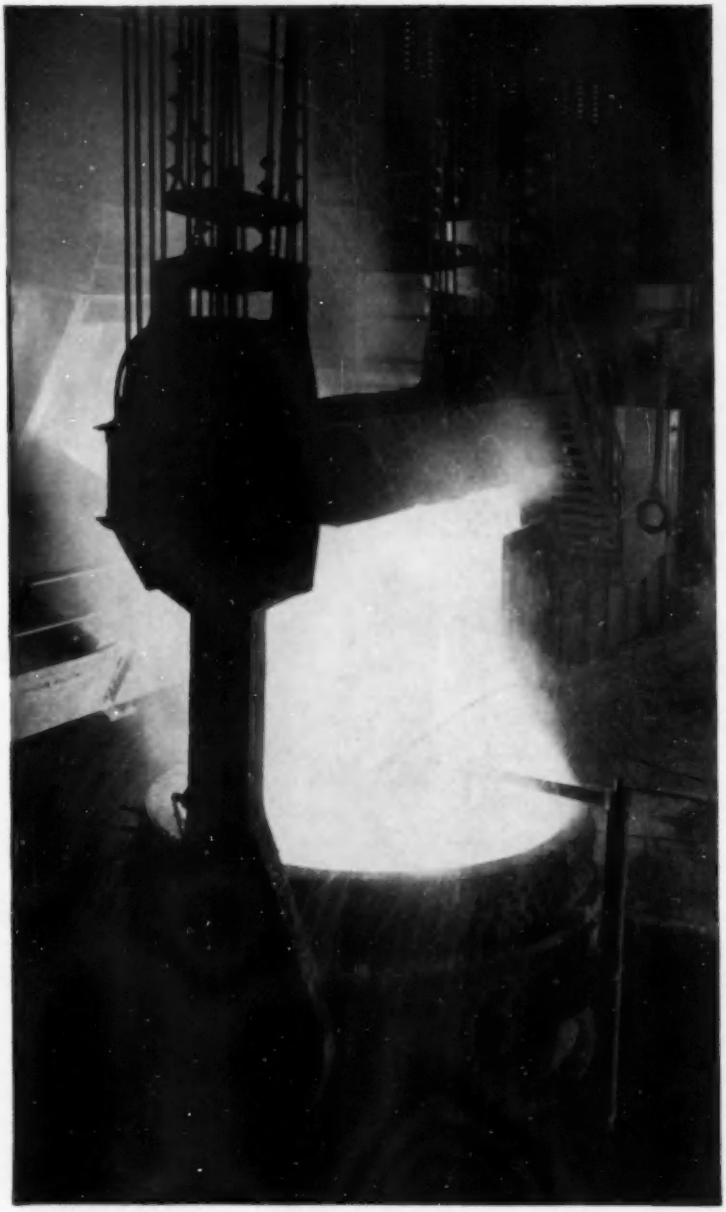

NICKEL makes steel tougher. So, our steel-making specialists don't skimp on nickel in the fine alloy steel we make for Timken® tapered roller bearings. They use exactly the right amount of nickel to give these bearings the toughness they need to withstand shock and last longer. Exacting quantities of chromium or molybdenum or both guarantee uniform hardness. By using the steel industry's first direct-reading spectrometer, we exercise hairline control of each element at the precise instant of tapping the furnace.

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